AUG 4 1923

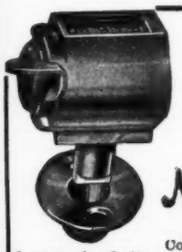
Telephony

THE AMERICAN TELEPHONE JOURNAL

PUBLISHED EVERY WEEK
BY TELEPHONY PUBLISHING CORP.
608 S. DEARBORN ST., CHICAGO, ILL.

AUGUST 4, 1923. [VOL 85. NO. 5.]
Entered as second-class matter Sept. 4, 1903, at the post office at Chicago, Ill., under act of March 3, 1879.

SINGLE COPIES 10 CENTS
YEARLY, U. S. A., $3; CANADA, $4
ALL OTHER COUNTRIES, $5



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Telephony.

THE AMERICAN TELEPHONE JOURNAL

Comprising Telephony, American Telephone Journal, Telephone Weekly, Telephone Magazine, Telephone Securities, The Telephone, Sound Waves
PUBLISHED WEEKLY BY TELEPHONY PUBLISHING CORP.
608 S. Dearborn St. Chicago

H. D. FARGO, President and Treasurer.
S. R. EDWARDS. Editor and Secretary.

J. R. HASTIE, Vice-President and Advertising Manager
H. D. FARGO, Jr., Western Advertising Manager

Entered as second-class matter September 4, 1908, at the post office at Chicago, Ill., under act of March 3, 1879.

Volume 85
Number 5

CHICAGO, SATURDAY, AUGUST 4, 1923

Subscription—10 Cents a Copy
$3 a Year U. S., Cuba and Mexico
$4 Canada, $5 Other Countries

CURRENT OPINIONS AND COMMENTS

More and more the people are coming to believe that when a hostile move is made against a public utility, somewhere behind the scene is a politician scheming to boost his own interests. And why shouldn't they? For instance:

In Chicago the other day the Illinois henchmen of Governor Small held a conference at which it was decided he would run for renomination. Within 48 hours the Illinois Commerce Commission (composed of the governor's appointees), which regulates the public service corporations of the state, came out with a flourish of trumpets and announced a cut in gas rates, a reduction in electric light rates, and plainly intimated that the Illinois Bell telephone charges would have to come down.

The dwellers in Chicago are known all over the world as being unsophisticated, guileless innocents, but it is not surprising that they suspect there is some significant connection between the two happenings.

* * * *

Of course, this is nothing new. Utility rates have been the favorite plaything of Chicago and Illinois politicians for many years. The managers of the companies have never been allowed to forget it, and they have faced the situation as best they could.

Samuel Insull, head of the gas and electric companies, says they will make an honest effort to comply with the reduction orders. The telephone company has been on the grill for more than two years and knew that some kind of a jolt was coming.

* * * *

Nevertheless, the political caucus and the crashing of service rates were so simultaneous as to seem funny.

Bear in mind that the governor's given name is Len, and read the Chicago Evening Post's pertinent comment on the two incidents:

"The cost of 'juice' is cut. Len's going to run again. Gas rates—commercial, not political—come down 5 cents a thousand cubic feet. Len's going to run again.

"The telephone company is cited to show cause why its schedules should not be sliced. Len's going to run again.

"All of which makes excellent soothing ointment for Governor Small to rub on the bumps of the bruised taxpayers of the state in the hope they will re-elect him."

* * *

The possible equity of the rate reductions ordered is not under discussion at this time. The electric rate cut is slight and the gas company has been in litigation with the city for years. Some business men think existing service rates in Chicago can be lowered without serious injury to the company, but this will be contested.

What sticks in the mind of the average observer, however, is that this movement against utility rates runs neck and neck with political ambitions which the reductions are supposed to advance.

A comical feature of the situation is that Frank L. Smith, who is chairman of the rate commission ordering the reductions, is also a candidate for governor. Now the question is: Which of the two aspirants will get the credit for "protecting the people" from the corporations? There cannot possibly be enough for both to win.

It is a queer situation which the utility interests are watching with an amusement that somewhat modifies their anxiety over the rate question.

* * * *

August 6 is the last day for filing briefs with the Interstate Commerce Commission on the question of what is a proper depreciation reserve to be set up by telephone companies. Considerable work has been done along this line since the hearing in Washington May 1, notwithstanding the summer season, but there is no probability of decisive action by the commission very soon.

The United States Independent Telephone Association has submitted a brief embodying the general opinions expressed by the directors at their conference at Washington. Other associations have filed their views on the subject, including a committee representing the national organization of the state utility and railway commissioners.

It is expected that the ideas of the state rate-makers will be given careful consideration by the federal body, as Washington does not wish to antagonize the state officials who have direct control of the telephone industry.

Fair play to the telephone business,

however, should induce the Interstate Commerce Commission to pay equal attention to the men who are in active charge of telephone companies and who are, therefore, more familiar than anybody else with their peculiar problems.

* * * *

After a month of controversy, the telephone operators' strike against the New England Bell is reported over, the strikers having voted to go back to work. Like many other labor troubles, this telephone strike grew out of a factional quarrel between rival union leaders, while the workers themselves really had little to say about the walk-out.

The female boss of one organization ordered the strike, and the head of the opposing union was against quitting work. It is interesting to the whole telephone industry to observe that the places of the strikers were filled promptly and service was maintained in most of the principal cities of the five states affected by the strike order.

The company assured the new workers that their jobs would be safe when the strike was finished, and this announcement —which was only fair play—delayed a settlement, as the strike leaders demanded that those who walked out should be reinstated in the employment they had so unceremoniously abandoned.

Rightly enough, the company declined to break its pledge to the new operators although willing to take back enough to fill the ranks. The situation was similar to that in which the railroads stood by the new employes who replaced the striking shopmen two years ago.

* * * *

According to press comments, the operators' strike did not have the support of popular opinion. The wage scale was at the war-time peak, but the strike leaders demanded shorter hours and more pay, although in other industries the tendency has been downward.

The belligerent union tried to cripple the telephone service by ordering its members to quit their posts in the hope of coercing the company to meet the boss' terms. The number of volunteers that filled the vacancies, and the attitude of the general public, soon foretold the failure of the strike.

While there was no talk of arbitration among the strikers prior to the walkout, they now demand that an arbitration board be named to decide whether or not the company shall be compelled to break its word to the new operators and discharge them to make room for the strikers.

It is not considered likely such a demand will meet with favor, either from the company or the public, in whose interest the new operators took up the work of continuing the service.

The Great Problems in Telephony

Solved and Unsolved Problems in Telephony Subject of the Fourteenth Kelvin Lecture before Institution of Electrical Engineers, London, England—Extracts Which Give Technical Information on Advances in Telephone Art

By Prof. J. A. Fleming, M. A., D. Sc., F. R. S.

The possible improvements in telephony are very closely dependent upon a knowledge of the nature of speech sounds and of the operation of the ear in appreciating them. A careful study of the problem of phonetics in its relation to telephony has been made during the past few years in the United States. The important matter, from the telephonic point of view, is the study of the frequency-ranges required to convey specific articulate sounds with adequate reproduction at the receiving end.

Broadly speaking, phoneticians divide the elements of speech sounds into five divisions: (1) Pure vowels, (2) combinational and transitional vowels (indicated by the letters *w*, *y*, long *i*, *h* and *ou*); (3) semi-vowels, *l* and *r*; (4) consonants, voiced, unvoiced, and nasalized; and (5) fricative consonants, voiced and unvoiced.

A very rough distinction between the vowel and consonant sounds is that the former can be uttered continuously as long as one has breath, but the latter are more or less abrupt beginnings or endings of vocal sounds.

The elements of all spoken languages are syllables which are composed of combinations of the vowel and consonant sounds. Words are built up of syllables. The telephonic conveyance of speech depends, therefore, upon the accuracy of reproduction of the syllabic sounds at the receiver. In order to test this reproduction, telephonic engineers, in connection with the American Telephone & Telegraph and Western Electric engineers, prepared large lists of syllabic sounds comprising from 8,000 to 9,000 speech sounds in all, arranged in groups of 50 or 100.

A large number of these syllables are spoken in succession clearly to a transmitter. A listener at the receiver writes down the syllable received according to a certain code word associated with it. The percentage of sounds correctly heard and written down is called the *articulation* of the system.

An account of certain research work of the above kind has been described by Harvey Fletcher in a paper* on "The Nature of Speech, and its Interpretation."

In this research a high-quality telephonic circuit was employed, comprising a condenser transmitter, an artificial line including thermionic amplifiers, an attenuator for weakening the speech currents in a known ratio, wave filters for passing currents only within certain ranges of frequency, and received by high-quality magneto receiving telephones.

By this apparatus speech sounds could be transmitted without distortion, but with amplitudes increased or diminished in exactly known ratios. When the amplitude is changed in the ratio of 2.71828 to 1, this is called reduction by 1 *napier*, since the above numeric is the base of the Napierian system of logarithms. If it is reduced in the ratio of $(2.71828)^n$ to 1, this is called reduction by n napiers.

If we begin with a just audible speech sound, which corresponds to a variable air pressure of about 0.001 dyne per cm^2 (R.M.S. value) for sounds of frequency about 1,000 p.p.s., and if we then increase the amplitude by about 7 napiers, which brings the R.M.S. pressure to about 1 dyne per cm^2, since $(2.71828. . .)^7 = 1{,}096$; we shall have a sound the loudness of which corresponds to the maximum articulation as judged by the percentage of correctly heard test-syllables transmitted. If the amplitude is increased still more, the articulation falls off again, as shown by the curve in Fig. 1.

The ear is "deafened," as we say, by very loud speech. Hence there is a certain amplitude which gives the maximum of telephonic speech articulation or intelligi-

*See Journal of the Franklin Institute, June, 1922.

bility. By means of the filters, which are artificial telephone lines constructed with inductive resistance in series of capacities in parallel, or vice versa, it is possible to attenuate very rapidly speech currents of a certain range of frequency either above or below certain selected limits.

The results of this filtering on telephonic speech transmission are very remarkable. According to the researches of Harvey Fletcher and those of Crandall and Mackenzie a filter which cuts off all currents of frequency below 500 p.p.s. stops 60 per cent of the speech energy but only 2 per cent of the articulation. This means that the speech is greatly decreased in loudness but not much in clearness or intelligibility.

On the other hand, a filter which cuts off all frequencies above 1,500 eliminates only 10 per cent of speech energy but reduces the articulation by 35 per cent. This means that the speech is not much reduced in loudness but is very reduced in clearness. A filter which cuts off all frequencies above 3,000 p.p.s. has as bad an effect on articulation as one which cuts off all below 1,000 p.p.s.

Some speech sounds, such as the vowels *u*, *o* and *e* have characteristics carried by frequencies below 1,000, but the fricative consonants denoted by the letters *i*, *z* and *th* have their specific qualities conveyed by high-frequency harmonics and are greatly affected by cutting off frequencies above 3,000 p.p.s.

The sounds denoted by the letters *f*, *v* and *th* are most difficult to hear and are responsible for 50 per cent of the mistakes of telephonic interpretation. Their current articulation seems to depend on the transmission of harmonics of very high frequency.

The general conclusion is that any telephonic apparatus designed for good speech transmission must transmit with equal efficiency and without distortion sounds of all frequencies from 100 to 5,000 p.p.s. Although the greater part of the sound energy is transmitted by currents and air waves of frequencies below 1,000 p.p.s., yet the essential characteristics of speech, and especially of consonant sounds, are conveyed by frequencies much higher than 1,000 p.p.s. and up to 5,000 p.p.s.

The poor transmission over ordinary telephonic circuits of certain consonants such as *f*, *v* and *th* is responsible for much difficulty, especially in the case of the names of digits such as *five, nine* and *three* in calling numbers.

In correlation with this part of the subject it would be interesting to discuss theories of hearing, especially the manner in which the ear performs a sort of instantaneous Fourier analysis of complex air-wave forms, appreciating the harmonics present with the fundamental tone, and not only their relative amplitude but, to some extent, their phase differences. Time, however, forbids anything but a brief reference to two well-known theories.

There is in the internal chamber of the ear a spiral tube called the cochlea and in this tube is contained an organ called Corti's organ. This comprises a vast number of fibers, some say as many as 16,000. According to a theory put forward by von Helmholtz in 1863, and modified by Gray, Corti's organ may be regarded as a microscopic harp of 10,000 strings, each

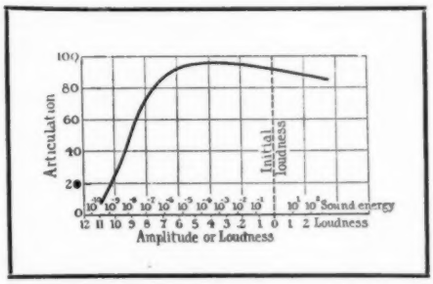


Fig. 1. Curve Showing the "Articulation" of a Telephone Circuit in Terms of Loudness of the Speech. (Harvey Fletcher.)

of which is tuned to resonate to a particular rate of vibration. It is, therefore, supposed to pick out and respond to the impulses due to the corresponding harmonic frequency in a sound wave, just as certain strings of a piano can be set in vibration by a clear note sung into it by a powerful singer.

This theory, though widely accepted, has, however, been opposed by some biologists and in particular the late Sir Thomas Wrightson, who propounded another view in 1873 which he elaborated in a book published in 1918 entitled "The Mechanism of the Internal Ear."

In a lecture given at the Royal Institute, London, in March, 1919, the eminent physiologist, Sir Arthur Keith, expounded this latter theory and explained that by Sir Thomas Wrightson's hypothesis the organ of Corti does not act as a resonator at all, as supposed by Helmholtz, but is an extraordinary sensitive pressure gauge which registers and appreciates minute and rapid changes of pressure applied to the fluid in the cochlea by the sound waves. It appreciates not only the frequency of these pressure-changes and their amplitude but also the manner in which the pressure alters during a single cycle of operations.

The nerve fibers in the Corti organ convey this information to the brain centers of audition where they are translated into sensations of sound, with its three distinctive qualities of pitch, loudness and quality.

If we call to mind the very distinctive qualities of individual human voices, even when pronouncing the same words, and the manner in which these tones can express emotions, feelings, or personality, all of which must be represented physically by minute differences in wave-forms, we realize that the human ear is indeed one of the marvels of creation in its amazing powers.

Telephone Considered as an Energy-Translating Appliance.

When we consider the very complicated nature of our vocal or speech organs, as well as the training and practice necessary for their efficient use, and the parts played by the larynx, oral cavity, lips, tongue and teeth in speaking, we find reason for great surprise that the mere vibrations of a small flexible disk such as the iron diaphragm of a Bell receiver, can impress upon the air, vibrations of the highly irregular waveform necessary to reproduce speech sounds.

When a thin, flexible disk is held firmly at the edges it can only vibrate in certain ways in consequence of elastic stretching, and it has, like a stretched string, a fundamental mode of vibration in which it takes a convex or concave form as a whole and also certain harmonic modes of vibrating in sections. In the case of a circular flexible disc of radius r, thickness t, made of material of density d, Young's modulus e and Poisson ratio q, Lord Rayleigh gave the following formula for the fundamental rate of vibration n of a circular disk clamped all round the edge:

$$n = \frac{2{\cdot}56t\sqrt{e}}{\pi r^2\sqrt{(3d)}\sqrt{(1-q^2)}} \quad \ldots\ldots (1)$$

The Poisson ratio q is the ratio of the lateral contraction to longitudinal extension of an elastic material when stretched. Its numerical value for steel is about 0.31, so that $\sqrt{(1-q^2)}$ is nearly 0.95 or not far from unity. Hence, approximately,

$$n = 1.48\,\frac{t}{\pi r^2}\sqrt{\frac{e}{d}} \quad \ldots\ldots\ldots\ldots (2)$$

But $\sqrt{(e/d)}$ is the velocity of sound in the material. We have, therefore, this very simple rule, that the fundamental frequency of vibration of a circular diaphragm clamped all round the edge is nearly equal to 1½ times the ratio of its thickness to its area, multiplied by the velocity of sound in the material.

The diaphragms of Bell receivers are usually made of thin, low-hysteretic steel such as that called "Stalloy" containing 2.75 per cent of silicon, and are about 5.0 cm. in effective diameter and 0.025 cm. thick. The ratio of thickness to area is then 1.785. The velocity of sound in steel is about 4,710 meters per second and hence the natural frequencies of the diaphragm by the foregoing formula should not be far from 942 p.p.s.

For a steel diaphragm of thickness t and diameter d cm. the above rule approximates to 900,000 t/d^2. Hence, for a diaphragm 1/40 cm. thick and 5 cm. in diameter, it gives n=900.

These dimensions have been arrived at by trial and give a frequency not far from 800 p.p.s., which is generally taken as a kind of mean frequency for speech waves.

In a paper published in 1912 by A. E. Kennelly and G. W. Pierce, it was shown that there are four constants of a telephone receiver which determines its performance throughout the frequency range of ordinary telephony, viz. 100 to 2,500 p.p.s. These are:

The force-factor, (A), or electromagnetic pull on the diaphragm in dynes per absolute C.G.S. unit of current in the coils; (2) the equivalent mass (m), of the diaphragm or a mass which, moving with the velocity of the center of the diaphragm, has the same kinetic energy as the whole diaphragm; (3) the motional resistance, (r), of the diaphragm, in dynes per unit of velocity referred to the motion of the equivalent mass; and (4) the stiffness constant, (s), or force in dynes per unit displacement in cm. opposing the movement of the diaghragm and referred to the equivalent mass at the center.

In their paper Kennelly and Pierce showed that valuable help could be derived in determining these receiver constants from a diagram called the *motional impedance circle* of the instrument.

If we measure with a suitable bridge arrangement the resistance and reactance of the telephone coils with alternating current of known frequencies and pure sine wave form, both when the diaphragm is freely vibrating and also when it is held fixed or damped, we find differences between these free and fixed values which are called respectively the *motional resistance* and *motional reactance.*

If we plot these differences as ordinates in terms of the angular velocity of the current or of 2π times the frequency $= 2\pi = \omega$, we obtain curves as shown in Fig. 2.

The motional resistance rises with the

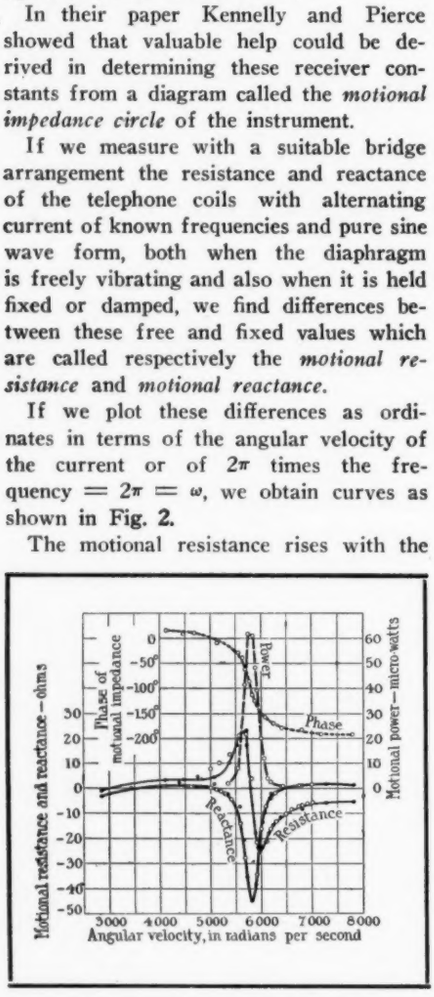


Fig. 2. Curves Showing the Motional Resistance, Reactance, and Power for a Bell Telephone Receiver, Plotted in Terms of Angular Velocity or 2π Times the Frequency. (Kennelly and Pierce.)

frequency to a maximum and then falls quickly through zero to a negative maximum. The motional reactance is mostly negative and has a maximum nearly coinciding with the resonance frequency of the diaphragm, at which frequency the power absorption of the receiver is a maximum also.

If we plot the motional resistance horizontally as abscissæ and the motional reactance vertically as ordinates, we obtain as graph a circle called the *motional im-*

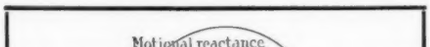


Fig. 3. Motional Impedance Circle of a Bell Telephone Receiver. (Kennelly and Pierce.)

pedance circle, and this passes through the origin. The diameter of this circle is depressed below the horizontal by an angle called the *depression angle* (see Fig. 3). The chords of this circle drawn through the origin give the vector impedance of the telephone for the corresponding frequency. The diameter of this circle drawn through the origin gives the motional impedance of the telephone at resonance.

It was pointed out by Kennelly and Pierce in 1912 that from an inspection of this motional impedance circle it is possible to obtain data which assist in giving the value of the four principal constants when combined with one other measurement. Kennelly and Affel showed in 1915 that if we measure the amplitude of vibration of the diaphragm at its center, produced by a sinusoidal alternating current through the coils of the telephone, we can find by the aid of this measurement and the motional impedance circle, all four characteristic quantities of the receiver.

Kennelly and Affel devised an ingenious optical instrument for making measurements of the amplitude of motion of the telephone diaphragm, not only at the center but at any point on it.

A. E. Kennelly and H. O. Taylor have given a curve showing that when a certain Bell receiver was traversed by an alternating current of 2 milliamperes with frequency considerably removed—(say by 20 per cent or more)—from the resonance frequency of the diaphragm, the amplitude of motion of its center was found to be about 0.5 micron—that is, 1/20,000 cm. or less. This is about equal to the length of the wave of light in the middle of the visible spectrum, viz. about 5,000 A. U.

If the frequency is gradually brought up to the resonance frequency of the diaphragm, the amplitude of motion would be increased 15 or 20 times, say to 7 to 10 microns as shown in Fig. 4. Lord Rayleigh found for a certain receiver that the amplitude of motion of the diaphragm when producing a just audible sound of frequency 256 was 6.8×10^{-5} cm., or only about 7 A.U.

P. E. Shaw,* by the use of an electric micrometer of his own invention, found, in very close agreement with Lord Rayleigh, that the amplitude of motion of the diaphragm of a telephone for a just audible impulsive sound, was 7×10^{-8} cm., or 7 A.U.

Taking the amplitude of the air particle for the just audible sound to an expectant ear to be unity, he found that the amplitude for a non-expectant ear must be increased to 7 or even 70, for a very loud sound to 1,400, and for an overpowering sound to 7,000.

Thus it appears that the amplitude of motion of the air particle near the mouth of a speaker in a conversational tone is about 100 A.U. or 1/100,000 mm., and the amplitude of motion of the center of a telephone diaphragm, when producing a speech sound just comfortably heard by a normal ear, is about 1/20,000 mm. The amplitude of motion of the air particle near the diaphragm is, therefore, considerably less than that of the diaphragm itself at the center.

In connection with this part of the subject an important matter is the displacement of the diaphragm at various distances from the center; in other words, the shape of the diaphragm as it vibrates.

A. E. Kennelly and H. O. Taylor have applied the above special form of optical callipers to this investigation and have given curves in a paper read before the American Philosophical Society in April, 1915, on "Explorations Over the Vibrating Surfaces of Telephonic Diaphragms" representing the principal section of the vibrating diaphragm. They have investigated the matter theoretically and compared the results of observations and the predictions of theory.

The exact theoretical prediction of the shape of a circular vibrating diaphragm

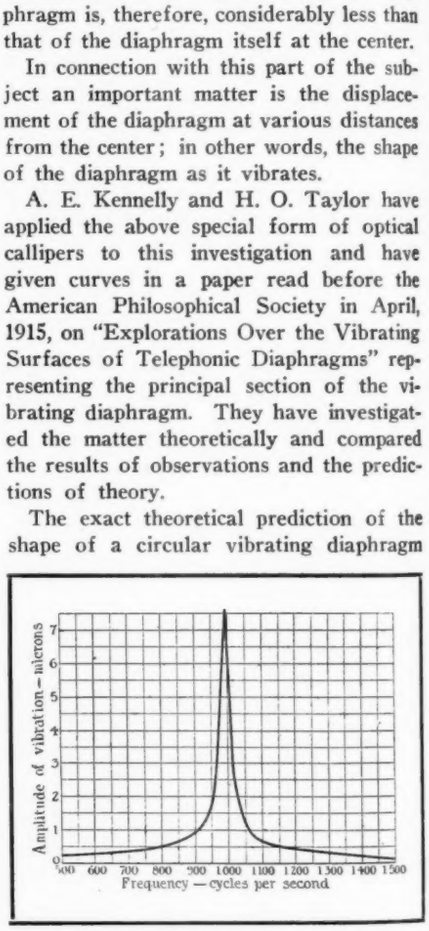


Fig. 4. Curve Showing the Amplitude of Displacement of the Center of the Diaphragm of a Certain Bell Telephone Receiver for Various Frequencies When an Alternating Current of 2 Milliamperes is Passed Through the Coils. (Kennelly and Taylor.)

when clamped at the edges requires rather advanced mathematics. I find, however, that a simple empirical formula agrees very well with experimental results.

If r is the radius of a circular telephone

*See Proceedings of the Royal Society, 1905, Vol. 76 A, p. 360.

diaphragm, and if y is the maximum displacement from a flat zero surface of a point on the diaphragm at a radial distance x from the center, and if Y is the maximum displacement at the center of the diaphragm, then

$$y = Y\cos^2\left(\frac{\pi}{2}\cdot\frac{x}{r}\right) \quad \ldots\ldots\ldots (3)$$

Thus, if $x = 0$, then $y = Y$, and if $x = r$, then $y = o$, which agrees with the boundary conditions.

Suppose we consider the diaphragm in its normal position to be flat and then to be drawn inwards in the center so that the profile of its principal section is the curve whose equation is given above. The displacements at various radial distances will agree fairly well with the measurements made by Kennelly and Taylor.

If V is the volume displacement of the air in front of the diaphragm due to this movement from flat to concave, then it is clear that

$$V = 2\pi\int_o^r x\cdot Y\cos^2\left(\frac{\pi}{2}\cdot\frac{x}{r}\right)dx = \pi r^2 Y\left(\frac{1}{2}-\frac{2}{\pi^2}\right) \quad \ldots\ldots\ldots\ldots (4)$$

But $\pi r^2 = a$ is the whole area of the diaphragm, and Y is the displacement at the center. If we consider a right circular cylinder whose height is Y and the area of whose base is B, then to have the same volume V, it is obvious that

$$\frac{\beta}{a} = \left(\frac{1}{2}-\frac{2}{\pi^2}\right) = 0.29 \quad \ldots\ldots (5)$$

We may then say that the effective area of a circular telephone diaphragm is 0.29 of its actual area. The *effective area* is defined as the area which, if equally displaced at all points with the displacement of the center of the real diaphragm, gives an equal volume displacement to the air. For a diaphragm 5 cm. in diameter the effective area is 5.8 cm².

If we consider a small source of sound radiating equally in all directions, and if we describe around it a sphere of radius r small compared with the wave-length λ, then at each oscillation a certain maximum volume of air, V, is displaced outwards and inwards by the wave motion across this spherical surface. If the frequency is n then the total energy in ergs per second, W, conveyed from the source by the sound waves is given by the equation

$$W = \frac{n^4 V^4}{400{,}000}\text{ ergs} \quad \ldots\ldots\ldots (6)$$

where V is measured in cubic centimeters.

This formula holds good approximately for any ordinary telephone receiver, provided we write for V the product YB, where Y is the maximum displacement of the center of the diaphragm in centimeters, and B is the effective area of the diaphragm is square centimeters. If then the telephone coils are traversed by a current, I, reckoned in milliamperes and have an effective or high-frequency resistance R ohms, the power, P, dissipated as heat by the telephone is 10 I^2R ergs. The power given off in sound-wave energy per second is given by

$$\frac{n^4 Y^2\beta^2}{4\times 10^5}\text{ ergs}$$

or if Y is measured in microns, μ, ($\mu = 10^{-4}$ cm.), then the sound power radiated is

$$\frac{n^4 Y^2\beta^2}{4\times 10^{13}}\text{ ergs} \quad \ldots\ldots\ldots (7)$$

Since this radiated power is small compared with P the telephone acoustic efficiency η is approximately given by

$$\eta = \frac{n^4 Y^2\beta^2}{4\times 10^{14} I^2 R} \quad \ldots\ldots\ldots (8)$$

For a telephone receiver with the usual 5 cm. diameter diaphragm, $\beta = 5.8$ cm², and the acoustic efficiency is then

$$\eta = \frac{8\cdot 4}{10^{14}}\cdot\frac{n^4 Y^2}{I^2 R} \quad \ldots\ldots\ldots (9)$$

Kennelly and Affel have given a number of data* of a certain Bell bipolar receiver with the standard diaphragm, to which this formula can be applied. At the resonance frequency ($n = 1{,}020$) of this telephone, the diaphragm displacement, Y, at the center was 10.45 microns, the effective resistance R was 224 ohms and the current 2 ma.

With these values we obtain an efficiency $\eta = 0.011$, or a little over 1 per cent. Taking from other data given by these authors for the same telephone at a frequency $n = 1{,}000$, slightly removed from resonance when $Y = 8.23$ and $R = 283$ ohms, we obtain $\eta = 0.005$, or ½ of 1 per cent. efficiency. At a frequency $n = 702$, far removed from resonance, we find $Y = 1.8\ \omega$ and $R = 130$, which gives $\eta = 0.00013$, or an efficiency of less than 1/80 of 1 per cent.

At the standard frequency $n = 800$ at which $Y = 1.9\omega$ and $R = 166$ ohms, the efficiency is just 0.00018, or rather less than 1/50th of 1 per cent.

Speaking very roughly we might say that a Bell telephone receiver used in ordinary telephonic conversation is taking in power electrically about equal to 1 milliwatt, and is giving out power in the form of speech air-waves about equal to 1 microwatt. It is an extremely inefficient machine for the transformation of energy, and far from perfect in its articulation as a speech-producing appliance.

The inefficiency of the Bell telephone receiver was pointed out many years ago by H. Abraham,† who deducted from certain measurements an acoustic efficiency of 1 part in 700 for a certain receiver at a frequency of 200 and a current of about 3.3 ma.

Louis V. King, in an article in The Year Book of Wireless Telegraphy for 1919, made deductions from some of the measurements of Kennelly and Taylor, which agree substantially with those of the author respecting the acoustic efficiency of the magneto receiver.

Here, then, is the chief unsolved problem of modern telephony—the invention of a receiver acoustically more efficient than the present type of magneto receiver, and with equal or better speech-reproducing power.

The chief sources of the inefficiency of the magneto telephone receiver are:

(1) Joulean heat loss in the coil;

(2) Eddy-current losses in the diaphragm and pole-pieces;

(3) Magnetic hysteresis losses in the same;

(4) Mechanical work done in bending the iron diaphragm; and

(5) Vortex motion or frictional losses due to air movements which do not contribute to wave production.

While considerable improvements have been effected, it is difficult to see how any great improvement in efficiency can take place without radical departure from the fundamental principles of Bell's invention.

In the well-known telephones of S. G. Brown, the iron diaphragm of the Bell receiver is replaced by a steel reed tuned to a certain frequency. The magnetic pull of the permanent part of the field magnets takes effect on this reed, which is capable of adjustment. To the reed is attached an aluminum cone with a flexible rim which plays the part of the diaphragm.

This diaphragm only partakes of these movements of the reed which are due to the telephone currents, so that when no speech currents are being received there is no strain on the diaphragm. Also, by reason of the material being aluminum, magnetic losses are absent. No doubt this type of receiver possesses a somewhat higher acoustic efficiency than the Bell, but I have not been able to find any determinations of it by independent observers.

Apart from the energy losses in the telephone, another defect from one point of view is that its diaphragm has such a marked resonance for a frequency lying in the middle range of the voice. The amplitude of vibration is greatly increased at this resonance frequency and hence speech distortion occurs.

In the human ear the tympanum is small and has a very high natural frequency. The result is that it can respond to those high harmonics which, as we have seen, give quality to the sound, especially consonantal speech sounds. Having regard to the enormous public use of the telephone, not only in ordinary telephony but in radiotelephony where the available power is

*A. E. Kennelly and H. A. Affel: "The Mechanics of Telephone Receiver Diaphragms as Derived from Their Motional Impedance Circles," Proceedings of the American Academy of Arts and Sciences, 1915, Vol. 51, p. 428, Table I.

†See Comptes Rendus, 1907, Vol. 144, p. 906.

limited, the improvement of the acoustic efficiency of the receiver is one of the most important problems that can engage scientific attention. As it stands, the telephone receiver is by far the most inefficient of all electrical energy-transforming devices.

The only forms of practical receiver for telephony which have so far presented themselves as just possible alternatives to the electromagnetic or Bell type are those depending: (i) upon thermal actions, (ii) on electrostatic attractions, and (iii) upon variations in the friction or adhesion of certain materials, produced by the action of small currents or differences of potential.

An example of a thermal receiver is that of M. de Lange and Fischer which was described in a paper sent to the Royal Society in 1915. It consists of a loop of very fine platinum wire or very thin strip of gold or platinum enclosed in a tube or capsule with exit holes. When telephonic speech currents are sent through the wire, it is heated and the sudden expansion of the surrounding air generates sound waves which make their exit from the holes. This chamber may take the form of an ebonite capsule which is placed in the external orifice of the ear.

This appliance has been much studied in the United States as a precision source of sound. H. D. Arnold and I. B. Crandall have embodied mathematical expressions connecting the heating current and air pressure-changes for certain forms of the instrument.‡ Another theoretical paper has lately been published on it by E. C. Wente.**

Although this thermophone is of service in the research laboratory, it has not yet replaced in any way the Bell magneto receiver in practice.

Another type of thermal receiver of some promise is that due to Leslie Miller, which he calls a loose-contact thermal receiver.† In this receiver two pieces of certain substances are employed, one in the form of a small disk attached to the back of an aluminum diaphragm, and the other in the form of a ball or point just slightly pressed in contact with the disk. The substances may be galena and carbon (graphite), or both carbon.

A small direct current is passed across the contact and, when a telephonic speech current is superimposed, the diaphragm reproduces acoustically the speech. The action may be due to a slight separation between the contact points due to the repulsion between the elements of a conductor conveying a direct electric current, and this is increased or diminished when the alternating speech current is superimposed, thus causing the diaphragm to vibrate.

This principle of a loose microphonic contact as a speech reproducer is well worth continued investigation. We have, then, in the next place the electrostatic receiver which in a certain form was originally suggested by Dolbear and by Edison, but in its most perfect form is the condenser transmitter and receiver already described.

Lastly we may mention the variable-friction principle which was employed by Edison in the quite early days of telephony in his chalk cylinder receiver.

In this instrument a cylinder of chalk, which Edison found is best to moisten with a solution of hydrodisodic phosphate, is slowly revolved. On it rests a light metal bar in connection with a mica diaphragm. When the cylinder revolves, the slight friction displaces the bar and cups in the diaphragm, but when a telephonic current passes from the metal to the chalk, the friction is reduced and the bar slips and communicates its motion to the diaphragm.

Sir William Barrett investigated the effect in 1879 and 1880§ and stated that he found that if the chalk was dry there was an increase of friction. Rollo Appleyard described in 1905 the adhesion of a metal plate to a dielectric when a difference of potential is made between them. This fact was re-discovered and applied in the construction of a telephone receiver by K. Rahbek and A. Johnsen using an agate cylinder and a metal contact block, as described in a lecture given before this Institution on May 26, 1921.

The most general statement that can be made is that when two substances, one or both of which may be a metal, or in a few cases both non-metals, are in contact with each other, the sliding friction is either reduced or increased by the creation of a difference of potential between them.

The whole phenomena has during the last two years been very carefully re-examined in the electrical research laboratory at University College, London, by H. M. Barlow, and the results of his work will before long be made known. In all these methods there are possibilities of constructing a telephone receiver which may perhaps be found to have greater acoustic efficiency than the present types of Bell receiver.

An electrodynamic receiver which seems to have great possibilities in the way of improved efficiency has been invented by M. L. Gaumont, who exhibited it recently to the Academy of Sciences at Paris.

The vibrating part of the instrument consists of a little cone of silk wound with a spiral of aluminium wire through which the telephonic currents flow. This is fixed between the poles of an electromagnet or of a powerful permanent magnet, the poles of which are bored out with holes to permit the air waves, which are produced when the coil vibrates in the magnetic field, to pass. This receiver is said to emit a very loud and clear sound.

The energy-transforming efficiency of the microphone transmitter has not been made the subject of so much experimental investigation as that of the Bell receiver.

In the ordinary microphone transmitter with associated induction coil, we supply power in two forms: (i) in the form of direct current, and (ii) in the form of aerial speech wave power which vibrates the diaphragm and modulates the direct current.

We have, therefore, Joulean losses in the carbon granules and in the induction coil circuits as well as magnetic energy losses in the latter, and, in addition, work is spent in the deflection of the diaphragm and in creating eddy currents in the air near it. Owing to the necessity for supplying the direct-current power, the actual proportion of the whole power applied which makes its appearance as electric speech current-power in the line must be small, but I have not been able to obtain actually measured results.

To overcome the difficulties connected with the low resonance frequency of the ordinary carbon microphone diaphragm, there has been a certain use of the condenser transmitter with a very tightly strained and, therefore, more aperiodic diaphragm for certain purposes such as wireless telephone broadcasting. Also improved forms of magneto telephone with thick diaphragms which have a natural frequency above the ordinary speech range have been employed very successfully for the same purpose in Great Britain.

It would, however, be very advantageous to get rid entirely of the necessity for a diaphragm. It is well known that the carbon electric arc can be used as a speech transmitter. Hence the new glow discharge microphone of Dr. Phillips Thomas of the Westinghouse Electric & Mfg. Co. of America, in which the speech air waves directly modulate an electric discharge current, is a distinct advance it is said to have been used for some time with marked success as a broadcasting transmitter in the United States.

(To be continued)

ANOTHER AXIOM.

"Those who buy all they want now may not have all they want later," which being interpreted means that Mr. and Miss Good Sport, who spend all of their money on clothes or amusement and save none for that "rainy day," will find the time coming when there are things they want that they cannot get, while the frugal young man or young woman who saves diligently and sometimes denies himself or herself the things they want, finds in later life that they have more money on hand to get that which they want. Do you follow me?—E. L. Chase.

‡See Physical Review, 1917, Vol. 10, p. 22.
**See Physical Review, 1922, Vol. 19, p. 333.
†See Journal of the Wireless Society of London, 1921, Vol. 2, p. 141.
§See Nature, 18th March, 1880.

A Car for the Telephone Installers

A Specially Designed Car Body Used by Installers of Tri-State Telephone & Telegraph Co., St. Paul, Minn., Carries All the Installing Material Necessary for Crew During Day's Work—Includes Unique Type of Reel

The Tri-State Telephone & Telegraph Co., St. Paul, Minn., has recently put into service a specially designed installation car body which, according to the boys who use it, is all that the doctor ordered and then some.

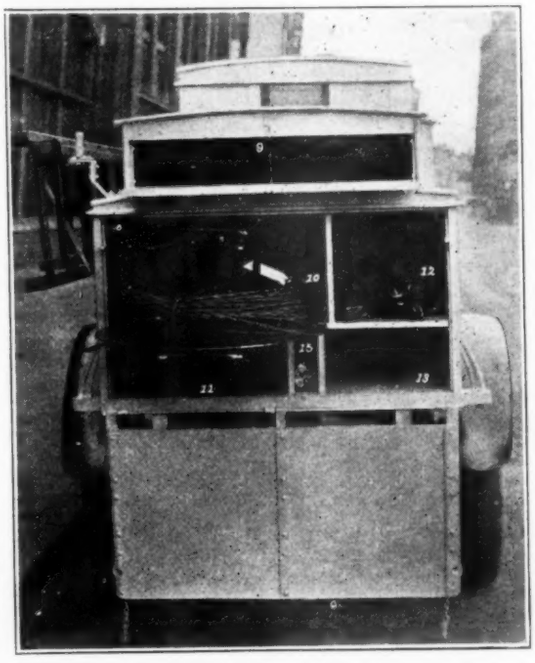
The body—designed by B. E. Leighton, installation foreman, and Glen Finger, draftsman, both Tri-State employes—is mounted on a one-ton Ford truck chassis and its many unusual features should prove of interest to other companies contemplating the construction of car bodies for this particular class of telephone work.

The designers had in view the construction of a body that would carry all of the material necessary for a crew during the day—material conveniently and easily accessible—without overloading the chassis, and still be neat in appearance. Telephone men who have seen the result of their work agree that the ends desired have been accomplished.

The total weight of the truck, loaded, is 3,500 pounds. The body weighs 1,130 pounds, the chassis 1,565 pounds and material 840. Special attention is called to the type of reel used in compartment No. 10 shown in the rear view. This reel was originated by Mr. Leighton, installation foreman.

The arms are collapsible and drawn together by means of a handle mounted on two of the arms before placing a coil of wire on the reel. After the coil has been placed in position, the arms are spread out to meet the inside of the coil by turning the handle to the right.

This procedure centers the coil of wire on the platform of the reel and eliminates overbalancing of the weight, a fault common to the ordinary type of reel. This centering of the weight on the reel platform also does away with the up and down motion which usually results in causing the wire to jump off the reel and kink.



Rear View of Installation Truck, Showing Unique Type of Wire Reel.

The Tri-State installers have fed wire off this reel with the truck moving at the rate of six miles an hour without experiencing any trouble. The same device also can be used for paying out both drop and copper wire and does away with the necessity of having two reels of different sizes always available for stringing wire.

In order to give an idea of the material carried in the various drawers and compartments the list of the material capacity of the truck is presented, the various numbers of the different drawers and compartments on the list corresponding to the numbers used in the illustrations.

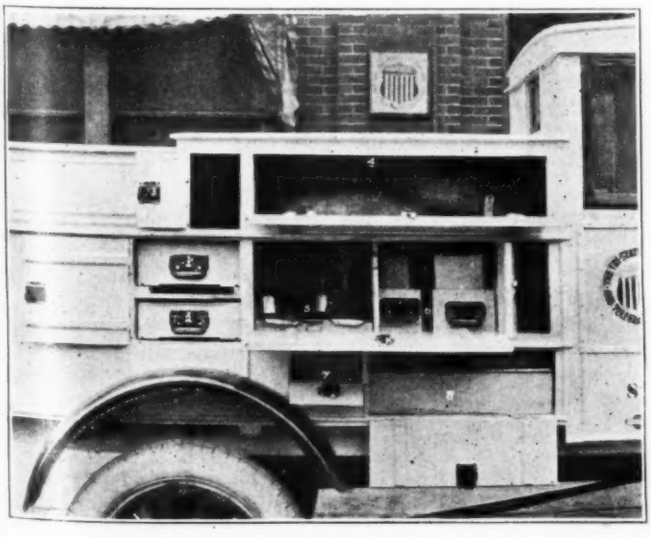
DRAWER NO. 1:

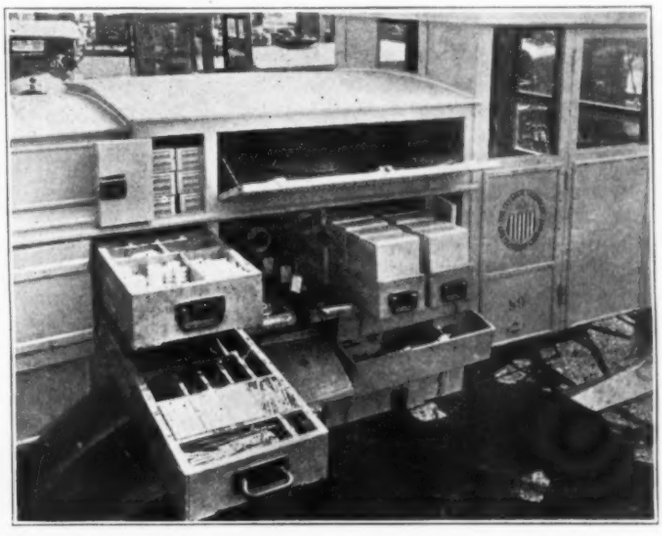
Four No. 144 receivers, 2 No. 323 transmitters, 2 dials, 10 ground clamps, 1 T. S. transmitter, 40 T. A. fuse, 3 boxes ¾ inch and ½ inch staples, 3 10-ft. cords, 5 6-inch cords, and 10 3-inch cords.

One gross 2½-inch R.H.B. screws, 2 gross 1¼-inch x 8 R. H. B. screws, 1 gross ¾-inch x 8 R. H. B. screws, 1 gross ¾-inch x 6 R. H. B. screws, 1 gross 1½-inch x 6 R. H. B. screws, 1 gross 1-inch x 6 R. H. B. screws, 1 gross 1-inch x 8 R. H. B. screws, 2 gross 2-inch x 8 R. H. B. screws, 6 No. 1370 receiver caps, 1,000 ½-inch and ¾-inch mil. nails, 10 Detroit blocks, 10 4-point blocks, 15 fuse clips, 20 8-inch clay tubes, 12 12-inch clay tubes, 50 C. knobs, 10 No. 2001 mouthpieces, 100 fiber cleats, 25 Fahnstock clamps, 20 3-inch x ¼-inch Pierce expansion bolts, 20 1¾-inch x ¼-inch Pierce expansion bolts, 1 lb. resin core solder, 3 candles, and 25 Cook cable terminal fuse clips.

DRAWER NO. 2:

One hundred 3-inch x 18-inch gal. screws, 8 span clamps, 50 3-inch x ⅜-inch bolts, 80 4-inch x ⅜-inch lags, 50 No. 3





Drawers and Compartments of Truck Numbered for Reference and Showing the Installation Materials Carried.

test clamps, 75 No. 2 test clamps, 100 No. 1 test clamps, 65 2-inch x 5/16 bolts, 144 2-inch x 14 gal, screws, 100 E rings, 50 C rings, and 50 linen tags.

Fifty combination No. 10 x 12 copper sleeves, 100 No. 17 copper sleeves, 30 pencil fuses, 30 11 C fuses, 40 5-inch x ⅜-inch bolts, 2½ lbs. friction tape, 60 No. 1 lead anchors, 30 No. 2 lead anchors, 30 No. 3 lead anchors, 30 No. 4 lead anchors, 15 house brackets, 12 pole brackets, 30 A knobs, and 30 B knobs.

COMPARTMENT No. 3: Used for removed materials.

COMPARTMENT No. 4: 500 ft. inside triple wire, 500 ft. inside twin wire, 400 ft. No. 18 bridle wire, 400 ft. No. 14 ground wire, 400 ft. No. 12 iron wire, and 5,000 ft. No. 17 P. O. D. drop wire.

COMPARTMENT No. 5: 7 50 A. L. stands and 7 20 A. L. stands.

COMPARTMENT No. 6: 7 534 A bells, 6 534 E. bells, 1 533 A. wall telephone and 1 293 A. small wall telephone.

COMPARTMENT No. 7: 12 Tri-State directories.

COMPARTMENT not numbered, next to No. 6: 3 116 bells, 3 166 bells and 1 295 A. A. bell.

COMPARTMENT No. 8: Installer's tool box: 12 O. G. cleats, 1 box ¾-inch and ½-inch staples, 100 1¼-inch x 8 R. H. B. screws, 100 1½-inch x 6 R. H. B. screws, 100 2-inch x 8 R. H. B. screws, 100 2½-inch x 8 R. H. B. screws, 500 ¾-inch mil. nails, 12 C knobs, 1 tube cutter, 1 ratchet brace, 4 8-inch tubes, 1 No. 58 A. protector, and 3 ground clamps.

Two ¾-inch x 18 wood bits, 2 ⅜-inch x 24 Syracuse bits, 1 ¾-inch x 24 Syracuse bit, 1 ¼-inch x 18 bit, 1 claw hammer, 12 micas, 12 carbons, ¼ lb. friction tape, 1 4-point blocks, 1 Detroit block, 1 flat file, 1 three cornered file and 1 No. 16 tool.

COMPARTMENT No. 9: 1 30 x 3½ tire mounted on rim and 1 32 x 4½ tire mounted on rim.

COMPARTMENT No. 10: 1 wire reel, 1,500 ft. P. O. D. drop wire.

COMPARTMENT N. 11: 1 6-ft. step ladder.

COMPARTMENT No. 12: Lineman's belt, lineman's climbers, 1 hand line, 1 pr. slack blocks, 1 No. 31 wrench, 1 soldering iron, 1 blow torch, 1 Star drill, and 1 Pierce hammer drill.

COMPARTMENT No. 13, miscellaneous drawer: 1 8 B. can cover, 1 8 C can cover, 6 No. 6 dry cells, 8 wooden pole steps, 2 telephone hand sets, 1 292 C gong, 20 60-D nails and 20 40-D nails.

COMPARTMENT No. 14, automobile tools: 1 jack, 1 sparkplug wrench, 2 tire irons, 1 transmission wrench, 1 pr. gas pliers, 1 monkey wrench, 1 screw driver, 1 hub cap wrench and 1 first aid kit.

COMPARTMENT No. 15: 10 ground rods.

ON SIDE OF TRUCK: 1 25-ft. extension ladder.

Reasons Why Public Utilities Should Use More Advertising.

Reasons why public utility companies should do consistent newspaper advertising are cited in a statement made by W. P. Strandborg, president of the Public Utilities Advertising Association, which held its first annual convention with the Associated Advertising Clubs of the World, with which it is affiliated, at Atlantic City early this summer.

Mr. Strandborg told utility company executives that their companies should advertise because:

"They have a $17,000,000,000 investment to protect.

They do $3,000,000,000 worth of business a year, and because intelligent advertising will stimulate it to greater growth.

The business comes into more intimate daily contact with more people than any other line of business in the world.

The business, which is so essential to the comfort and well-being of the people, is highly technical and the public does not understand it.

The problems are the problems of the people and their sympathetic understanding and support is needed.

The people will be fair when they do understand all the facts, and systematic advertising is the most effective way to tell the story and give the people the facts.

The place of advertising in the present economic system is thoroughly well established.

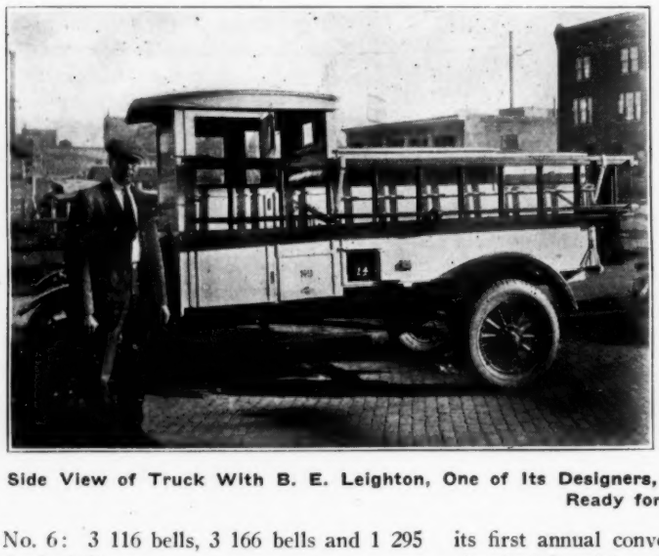
Public utility commissions in many states have recognized advertising as a legitimate operating expense, both in the creation of good will and business building, thereby nullifying the somewhat widespread popular criticism that advertising by public utilities is a needless extravagance."

Getting Ready for Increasing Service Demands.

To provide telephone service for the new hotels that are being erected in St. Petersburg, Fla., 2,000 new instruments have been purchased by the West Coast Telephone Co. and a large amount of wire has also been ordered.

The larger hotels in St. Petersburg, including four new ones, are to have private exchanges, and the two newspaper plants, The Tourist News and others, will also have private exchanges. Joe Kerrick, manager of the local telephone company, is purchasing a lot of equipment for the central exchange in St. Petersburg and for the new exchange that is to be located in Pasadena to take care of the business on the west end of the city and Pass-a-Grille. He says that service will be greatly improved when he completes the installation of the new equipment. He is providing 1,000 instruments to take care of the increased demand for telephones next season.

At present all telephone calls are handled through the one central office, but with the new exchange in Pasadena the St. Petersburg central office will be relieved of some of the calls. The number of calls now being handled is equal to the peak of the season in 1922 and Mr. Kerrick estimates that next season there will be a million calls a month in the busiest season.



Side View of Truck With B. E. Leighton, One of Its Designers, Ready to Explain Its Uses.—Compartment Side of Truck Closed Ready for Traveling.

Relation of Accounting to Rates

A Good Accounting System Is of Great Assistance in Determining Rates—Consideration of Accounts Which Are Most Important—Paper Presented at the Annual Convention of the Pennsylvania Association in Harrisburg

By G. S. Call

Chief, Bureau of Accounts and Statistics, Pennsylvania Public Service Commission

Some 15 to 20 years ago, there was a saying that an accountant was "a bookkeeper out of a job." In those days, the field of accounting work was very limited indeed.

There were a few public accountants struggling to make a living, and they were occasionally called in to audit cash records when it was suspected that the cashier had been dipping too freely into the cash drawer. They were also employed to check the postings to the various ledgers, and to do similar, purely mechanical work; but the idea that an accountant might be used to interpret the results of business activity, or to act as a business counselor was something almost unknown.

In the last ten years, however, there has been a great advance in the science, or art, of accounting, and there are a number of reasons for this development. Not the least of them was the introduction of the federal income tax.

As most of you know, the income tax laws require companies and individuals to make a detailed statement of their revenues and expenses, and the tax returns are so complex that a modern system of books is necessary to supply the required information.

In recent years the schools and colleges have nearly all established courses in accounting and, in addition, the Interstate Commerce Commission, the Federal Trade Commission, and many state commissions and organizations have endeavored to introduce modern accounting methods in various lines of business.

Purposes of Accounting.

What is the purpose of an accounting system, and why have the various state public service commissions prescribed uniform classifications of accounts for utility companies?

There are two main purposes for any accounting system: First, to show the financial condition of a concern at a given date; and, second, to show the financial progress of the concern over any given period of time.

The financial condition is shown by the "Balance Sheet," which is a statement of assets, liabilities, capital stock, and surplus; and the financial progress is represented by the "Income Account," which shows the various items of revenue, the operating expenses, and the amounts expended for interest, dividends and other purposes.

In going over old systems of books—of the kind in vogue a generation ago—one often finds, for example, an elaborate form of journal, kept in a beautiful Spencerian hand, and a cash book, which records every dollar received and disbursed. Yet the old style systems of accounts were often valueless because the entries in them were not sorted and weighed and classified, in such a manner that they could be used to prepare statements of financial condition and financial proggress. In other words, the old style books did not present a clear picture, illustrating the results of the business operations.

Out in the woods of Northern Michigan, there is a fabulous animal, known as the "side-hill walloper." The old land lookers and hunters of that region delight in meeting some tourists from the East and telling them marvelous stories of the side-hill walloper. Now the peculiarity of the walloper is that his legs on one side are shorter than the legs on the other side, so that the walloper must always travel on the side of a hill—he is unable to navigate on level ground.

As a result of his physical defects, when the walloper starts out on an exploring expedition, he is forced to travel around the side of his particular hill, and, in a short time, he finds himself back at the starting point, with nothing to show for his expenditures of time and energy. The old style systems of books possess some of the same failings as the side-hill walloper—they fail to get results, and they present little information in return for the time expended on them.

I shall not attempt to explain in detail the various accounts which are necessary in a modern system of books, but shall dwell briefly upon the main divisions of the accounts, and particularly on those accounts which are of importance in rate cases.

Accounts Important in Rate Cases.

Rate regulation is essentially a financial problem. In one of the most important of the early rate cases, Smyth vs. Ames, the United States Supreme Court said that a fair return on the fair value of property used in the public service was the most important matter to be studied in determining the reasonableness of rates.

In the same decision, the court mentioned a number of elements which should be considered in determining the fair value of property, and, among them, were the original cost of construction, and the amount which was expended in permanent improvements. Consequently, it is important that the property accounts should be accurately kept, because courts and commissions still hold that the cost of property must be considered in determining fair value.

In determining the cost of property there are certain intangible items, or "overheads," which should be included. For example, there are the organization expenditures, including the fees of attorneys engaged in organizing the company, the cost of prospectuses, and stock certificates, and the necessary fees and bonuses paid to the state government.

Plant Cost Includes Many Items.

There are other expenditures which are necessarily made during the period when the property is being constructed, and these are considered a part of the cost of the plant. Interest during construction, insurance, and taxes during construction, the salaries of general officers, engineers, superintendents, and clerks, during construction, and similar items are treated as proper charges to the property accounts; but when the construction period is over, and the plant has begun to operate, the operating expense accounts must bear the burden of these costs.

Working capital is another factor to be considered in determining fair value. Working capital may be defined as "the amount necessary to finance current operations, and to maintain the company's credit." The excess of the current asset accounts over the current liability accounts is often taken as a fair measure of working capital.

On the other side of the balance sheet, we have the capital stock and funded debt, the current liabilities—such as accounts and notes payable—and the various accrued and reserve acounts.

One of the most important accounts to be considered in a rate case, is the reserve for depreciation. The term "depreciation" is not a popular word in public utility practice, and the reserve is sometimes called by some other name, such as "Reserve for Renewals," "Replacement Reserve," "Retirement Reserve," or some similiar title, but whatever this reserve may be called, its purpose is always the same—to provide for the loss which will inevitably take place when the different units of property are scrapped, or retired from service.

A certain item of equipment may cost $1,000, and have an estimated life of ten years. By charging the operating expense and crediting the reserve account each year with one-tenth of the cost of the property, we will have at the end of ten years a reserve sufficient to provide for the entire loss when the equipment is retired from service.

If we did not have the reserve, the entire book value of the property would have to be charged to the operations of the year in which the equipment was retired, which would throw an unjust burden on the operations of that particular year. By setting aside a reserve, the operations of each year are required to bear their fair proportion of the cost of the property.

The last account on the liability side of the balance sheet is the surplus account, and the term "surplus" still seems to be somewhat of a mystery, even among those who have given some study to accounting. Some years ago, I made an audit of a wholesale hardware concern. The company's book-keeper was a new man who had been employed for only a week or ten days. As he saw us taking off a trial balance of the books, he pointed to the item of surplus, and said, "Where do they keep this surplus? I have been looking all around the place for it, and I cannot find it anywhere."

It took considerable explanation to make it clear to the book-keeper that the surplus could not be tied up in a bag and kept in some corner of the safe, and that it was not even represented by any specific assets. "Surplus" is only the excess of the assets of a concern, over and above the combined liabilities and capital stock.

The importance of accurate and complete records in rate cases is clearly illustrated by a decision of the United States Supreme Court last year in the Consolidated Gas case. In that case the court said:

"Complaint is also made because the master admitted appellee's books in evidence. These books were kept in the ordinary course under general supervision of the commission, appeared free from suspicion of dishonesty, were submitted to appellants' experts and were the only readily available sources of detailed information concerning the company's affairs. In the circumstances we think no harm resulted from admitting them as prima facie evidence."

It is striking testimony to the value of good accounting records when we consider that the books in this case were accepted as prima facie evidence by the highest court in the land.

The next subject which I shall mention is one that will probably not be popular on this particular occasion, but which I am sure will be a popular topic a couple of years from now. It is a uniform system of accounts for the small telephone companies.

ELBOW THRILLS.

By Miss Anne Barnes

Traveling Chief Operator, Iowa Independent Telephone Association, Des Moines, Iowa

Recently, I had occasion to visit a well known summer resort. My reason for being there was unlike that of most of the other temporary residents, for mine was a business reason.

It was surely interesting and amusing to watch some of those vacationists. People from every walk in life were mingling—rather, were being thrown together. This forced mingling was a bore to some, while to others this touching of elbows with the idle rich was a complete satisfaction. In fact, to this latter group, the rate of $4 a day was a mere detail when offset by such advantages.

When Mrs. Aintgot arrived at the hotel with Henry (Hank at home) and the children, although it was very late, she created enough confusion to awaken all the people in the house. She ordered more towels, ice water, and rooms with more view. I could see a reason for the towels and ice water, but I could see no reason for more view from a bedroom window of a summer resort hotel.

"But," she expostulated with Henry, in the hallway, when he objected to waiting for a change of rooms, "we're paying for it, and we're going to *have* it."

When they were all supplied with ice water, more towels, and more view, she gave her family orders as to what clothes to wear the following day.

The next morning they were all marshalled by Mrs. Aintgot into the dining room. Their clothing had that new look which store clothing has that has not shaped to the form wearing it. Henry, especially, wore his clothing as though he were not used to its kind.

After they were all seated, Henry mentioned a few things with his hands to the children; but only a *few*, for Mrs. Aintgot jerked him by the sleeve and said: "Don't talk with your hands. If you don't know what to do with them, put them under the table." Henry did. It was natural that Henry should look around to see who his wife was addressing when she called him "Henry," as this was his first day out under the new label.

The bill of fare called for watermelon. As Henry read it, I saw a gleam of joy in his eyes. But when a dish containing three little round balls, about the size of cherries, swimming around in pink juice was set before him, he said to the waiter: "I ordered watermelon, not cherries."

The waiter replied, 'That's watermelon."

Henry had committed his first—and I am afraid—not his last social error. "Poor Henry," I thought, as I glanced at Mrs. Aintgot.

After breakfast, Henry was allowed to go fishing, as some men, who looked rather prominent, were getting up a fishing party.

As for Mrs. Aintgot—well, she followed no particular plan. If a Mrs. Highbrow sat on a rustic bench in front of a hotel, Mrs. Aintgot sat on the same or a nearby bench. When Mrs. Highbrow went swimming, Mrs. Aintgot also went swimming.

I suppose there were several other vacationists of Mrs. Aintgot's type there. In fact, we meet them everywhere, but at a summer resort they are a trifle more difficult to recognize; generally before we really know them, they "motor on," back to their little bank balances which are really too small to be left alone any longer. In fact, many people take them right along. No one knows, you know.

The Interstate Commerce Commission has prescribed an accounting system for "Class C" telephone companies, and every classification prepared by the Pennsylvania commission must necessarily harmonize with that of the Interstate Commerce Commission. The system of accounts will be made as simple as possible, in order that it will not be a burden upon the small companies.

Some of you may have in mind the question "Who is benefited from this proposed uniform accounting plant?" It is true that the public will benefit, because they will be able to determine the necessary information from a company's books, at a considerably lessened expense, in a rate case.

The public service commission will also benefit, because it will have available complete and accurate records of the various telephone companies—but the greatest benefit will be received by the companies themselves, for the reason that their officers and stockholders will have available complete information to show the financial condition of each company and the results of its operations.

What North Dakota Operators Say

Some Ideas About Furnishing Telephone Service to the Public, Timing Tickets, Toll Calls, and Rates—Papers Presented at Various Operators' Schools Held Under the Auspices of the North Dakota Telephone Association

The Employe and the Company.

By Miss Knapp, *Chief Operator, Dazey, N. Dak.*

Telephone companies are generally known as public servants—that is, they serve the public by providing a service that is very necessary to a large proportion of the community. In order to operate, a company must get permission from the public in some form of franchise. Then in return the telephone company must give efficient service because the public expects it.

It should give efficient service 24 hours a day and seven days out of the week. In the smaller offices they close at night, but frequently there are important calls that sometimes involve a question of life or death, and if they had 24-hour service it might mean the saving of a life. So why not have 24-hour service, if any at all?

We must get the good will of the public, which we can by giving efficient service, being polite and courteous.

In some cases, charges may be considered excessive but we must give such good service that it will command the good will of the public. We must treat the whole public as we treat our nearest friends. We must have efficiency in everything from advertising to collecting.

The company is often judged by its employes. Things we say and do while at work and after working hours have a great deal to do with the company. Our general conversation should be uplifting and a help to the company and our fellow employes.

We should, in all cases, be polite and courteous. Courtesy costs nothing but it brings wonderful results.

We must have system and co-operation in our work so as to win the favor of the public and create a friendly feeling toward our company.

The two big departments of the telephone company are the plant and traffic departments. These are very dependent upon each other, more so in smaller companies than in the larger ones. Operators on small systems can help very much by learning to give good tests to the troubleman while he is out on a line on which there is trouble.

If we feel a bit bigger than the position which we are holding, we can put forth our efforts to make it come up to the standard. We must not feel as though we weren't capable of handling it but try, and try hard, to do our best and we'll win in the long run. One who never does any more than he is paid for, never is paid for any more than he really does.

Every company should be well equipped, but good equipment cannot overcome lack of efficiency and co-operation in the operating force. One person cannot fill every place. Each must have special duties and put personality into his work. We must learn one thing and learn it well before trying something new.

We must try to please those for whom we are working. We must be ready to acknowledge our mistakes and overlook the mistakes of others. We must not think we are always right in everything; think we cannot make errors. We all do—and we must be willing to admit them.

We must be ready to help students or other employes just beginning. Sometimes they are starting out in life and haven't had any training along this line and we are oftentimes backward in rendering assistance. We should take them in, as we would into our own home, and treat them as one of the family. Introduce them to the other employes, show them around and explain the different things so that they won't feel as strangers. Give them encouragement. Help them.

The Interest of Other Departments in Correct Ticket Timing.

By Miss Ida Nord, *Chief Operator, Fargo, N. Dak.*

There are numerous phases of the traffic work to which we can attach an unlimited amount of importance, and all of which go towards bringing in the 'revenue.' This is the ultimate result for which all departments are working and, therefore, particular stress should be brought to bear on the operators' duties to this end.

Perhaps there are a great many operators who little realize how important a part they are playing in the regular operating routine when they "Time a Ticket," which really means, bringing in the revenue. Oftentimes one will find an operator who is more or less indifferent as to whether the call is properly timed and the calculagraph stamp legible enough so that the time consumed on a call can be quickly and correctly read by any one handling the ticket in the traffic, commercial or accounting departments.

Incorrect reading of the time registered on the ticket means loss of revenue. If an operator would stop to realize that, instead of handling a mere ticket or piece of paper, she is handling actual *cash* and is liable for any shortages that may occur, a little more importance might be attached to this end of the operating work.

Tickets are stamped as soon as anyone at either station speaks to and receives a response from the other station, except where one party speaks to the other and continues to talk without waiting for a response. An allowance of 15 seconds is made to prevent a patron from being charged for any of the time required in stamping of the ticket at the end of the conversation.

Improperly stamped tickets, such as uncompleted or crookedly-stamped tickets, unsatisfactory service or messages repeated, are referred to the supervisor. She shall write an explanation on the back of the ticket and sign her personal number.

Minutes, if properly termed in the sense of telephone classification, mean the same as money, for when we sell the subscriber toll service, he is paying for the circuit involved, labor time of the operator, equipment as well as service, in the form of minutes. Errors occur in undertiming a subscriber as well as overtiming a subscriber, and in cases of this kind, adjustments generally have to be made. These involve additional expense and waste of time to the commercial department, which cost is not covered in the timing of the ticket, and they also delay the work of the commercial and accounting departments.

During a recent peg-count period, one of our operators noticed that the calculagraph registered p. m. when it should have registered a. m. If the operator had not noticed this, there would have been numerous discrepancies in rating tickets. These would have caused complaints from subscribers and a great deal of inconvenience to the commercial department in making the necessary adjustments, as subscribers would have been charged the evening station rate when they should have been charged the day station rate, according to the ticket. The rate operator would not know if the passing time on the ticket was correct or if the calculagraph was correct.

If calls are properly supervised, errors in timing would seldom occur. Oftentimes mistakes are made in the reading of the calculagraph stamp, due to the registration being so dim or the calculagraph being out of repair. This also would be the fault of the operator if it had not been reported to the plant department, which makes all the necessary adjustments and repairs to calculagraphs.

It would be well to bear in mind at all times that traffic errors seriously affect not only the work in the traffic department, but also the work in the commercial department, and especially that of the accounting department. Therefore, it is doubly important that tickets be correctly timed, for it is a matter of dollars and cents to both the subscriber and the company.

The Precedence of Long Distance Calls and Orders.

By Emma Rice, *Instructress, Grand Forks, N. Dak.*

In our attempts to complete calls we are instructed to work out on them according to our precedence time. Where we have two or more calls of different classes we should try to complete them in the following order:

First, the calls on which conversation has already been started but has been delayed on account of a cut-off or a request for a better connection. I think the reason that this class is given precedence is that a party who has already been talking and has been cut off is apt to be very impatient and cannot understand the cause for the delay. It is our aim to give satisfactory service to every one, and the sooner that we can reëstablish the connection the better satisfied our patron will be.

Second, appointment calls, especially on appointment calls where the appointment has been previously arranged, a decided effort should be made to complete the call as near to the specified time as possible. As our appointment call rate is higher than the other rates, a subscriber usually has a good reason for requesting an appointment.

Third, the *WH* reports received from the called party. If a party has reported that he is ready to talk on a call he will, as a rule, expect to be called within a short time, and he may have to delay some other work in order to be near the telephone when the call comes in.

Fourth, the delayed calls which do not immediately require the use of our toll line, such as trying to reach our subscriber's line on a different outward call or a telephone at one of our tributary offices. The precedence time of the subsequent attempts of these calls is determined by the class in which they belong.

Fifth, all other calls, orders, and reports which do not come under the preceding classes. Our *NC* call orders shall be classified and handled the same as outward calls.

In determining our precedence time on first attempts, and also on second attempts, to reach a busy telephone over direct circuits, our filing time should be used as our precedence time. When a subscriber asks to have his call held, the later time that he asks to have it worked on would be your precedence time. On sequence calls it is the filing time on the first call and the time the preceding call was disposed of on the following:

On subsequent attempts the last report on your ticket would determine your precedence time. For example, if a report was received that the called party was expected at 2:30, your precedence time on the subsequent attempt would be 2:30.

Answer to signals, such as flashing cord signals, disconnects, or any that may appear on your board, should be given precedence over anything else.

When two operators meet on a circuit much time will be saved if the operators will compare their precedence time and immediately give up the circuit as soon as one finds the other operator has a right to it. If a circuit has been built up and the distant operator has a call for a point beyond your toll center that may have an earlier precedence time than your out call, the circuit should not be given up, but a call order may be left for the desired office.

If the circuit is being held up on a through connection, the operator may cut into the connection if no conversation is being held and ask for a clearance order. If the originating toll center operator has already passed a call and is waiting for a report, you should cut out immediately. If, in a case like this, you notice that the circuit is being held up unusually long and it seems due to faulty operating, it is advisable to refer it to your supervisor, who in turn should report it to the distant supervisor.

If, when you cut-in on a through connection, you find that the original toll center operator is about to pass a call, you can compare precedence time with her; or if her order is for another station to which your circuits are busy, more time can be saved by passing your *NC* report and taking the call, if it is passed, than to compare your precedence time.

During the time of heavy traffic to certain points, it may be advisable to have a certain operator handle the call. In such a case the ticket would either be sent to that position for completion, or a memorandum ticket be sent to that operator showing your precedence time. She would then be required to give you the circuit when your precedence time would have the right.

Last, we have our emergency calls. These calls, as we all know, are the most important of all and every effort should be put forth to complete them with as little delay as possible. Even if a call has already been passed over a circuit, the circuit may be challenged for and taken, providing conversation has not already started. Coöperation between operators in cases of this kind is of initial importance and cannot be emphasized too strongly.

Development of Classified Toll Rates and Their Advantages.

Mrs. Esther Young, *Edmore, N. Dak.*

During the early history of the telephone industry, we had no classified rates as only a very small percentage of people had telephones. The only kind of long distance service that could be furnished was what is now known as person-to-person service, and the rate charged was usually so much per conversation, regardless of circuit time used or the distance between the calling parties. As the use of the telephone increased, the demand for toll service increased accordingly, making many improvements necessary in operating methods.

With this in view a study was made of circuits on which traffic was especially congested. From this study it was found that as the length of conversations varied greatly, a time limit would be necessary. A period of five minutes was adopted and remained in use until it became apparent that a shorter period was necessary.

Through these studies it was also found that as calls for long distances were more expensive to handle than calls for shorter distances, toll rates would have to be graded according to the distance the message was transmitted as well as the time used in conversation.

With the increased use of the telephone came the demand for quicker and more accurate service. Thus the station-to-station method was established. Studies made throughout the system indicated that calls could be handled on a station-to-station basis quicker and more accurately and at less cost than calls on a strictly person-to-person basis.

Though no inducement was offered in the way of lower rates, an attempt was made to educate the public to use the station-to-station service, pointing out by advertising, etc., the speed, reliability and convenience of this class of service. As the public came to realize these advantages, the demand for this class of service increased and in 1916 a nation-wide study was made of toll traffic to determine the relative cost of furnishing the different classes of service called for by the public.

The present classification of toll rates was based upon this study and is as follows:

Station-to-station rate.
Person-to-person rate.
Appointment and messenger rate.
Evening and night rate.
Report charges on uncompleted person-to-person calls.

The station-to-station rate is applicable on calls filed between the hours of 4:30 a. m. and 8:30 p. m. on which the calling party does not specify any particular person, but will speak with any one at the address under which the telephone is listed.

Person-to-person service is more expen-

sive to produce and is, therefore, subject to a higher rate than station-to-station service. The person-to-person rate applies to calls on which the calling party desires to reach a particular person at the called place.

Calls made collect are also subject to this rate, as before we can assess the charge against the called telephone we must obtain permission from the particular person wanted. This, in itself, changes the nature of the call.

Messenger and appointment calls are subject to our highest rate, which is applicable on person-to-person calls on which a paid messenger is sent, or calls on which the calling party desires that arrangements be made with the called party to talk at a special time.

A report charge is a charge made for cost of labor and use of facilities in trying to establish a connection on a person-to-person call and is approximately 25 per cent of the station-to-station rate. This is below cost, but to base the charge upon cost would be unfair to our patrons as they do not receive, on the average, value equal to the cost of this service.

Report charges are necessary because they eliminate waste, abuse, and fraud.

Evening rates are in effect on station-to-station calls filed between 8:30 p. m. and midnight and are approximately one-half of the day rate. Night rates apply to station-to-station calls filed from 12 midnight to 4:30 a. m. and are about one-fourth of the day rate.

Evening and night rates do not apply to person-to-person calls, as this class of service has been found more difficult and expensive to handle at night than through the day. The main purpose of these rates is to keep in use circuits and equipment that would otherwise be idle through the night.

The chief advantage of classified rates lies in the fact that they prevent waste, as for a patron to place a person-to-person call when a station-to-station call would serve equally well, results in a waste of time and equipment for us as well as being an extravagance on the part of the user.

In summing up classified rates, they are based on actual cost of service plus a fair return for the money invested.

Proper Routes and the Transmission Advantages.

By Mrs. Estelle Robinson, *Chief Operator, Rugby, N. Dak.*

Some times there is a question in an operator's mind as to why a call should be routed over a certain circuit when the called station can be reached over a shorter route.

The reason for this is that each call must be so routed that the best transmission is received with the least operating expense and without using any more line than is needed. It is very plain that if we use too much line for one call, our circuits will be loaded very heavily and we will receive a very small amount of revenue. On the other hand, if we study out the shortest and best routes and follow them, there will be a large saving in the time that it takes to complete a call; also we will receive a great deal better transmission in almost every case.

It will be found, in nine cases out of every ten, that it is better to delay a call until a good circuit can be obtained rather than put up the connection over a noisy circuit which will cause the subscriber to repeat so much of the conversation that it will require four or five minutes to complete a two or three-minute call. This will cause a great deal of dissatisfaction to the subscriber—and the fault will all be with the operator who put the connection up on a poor line.

The load on each circuit has to be distributed so that each one will have an equal amount, or we will have some circuits that are overloaded and some that are idle most of the time; also, if we have a circuit that is overloaded, there will be calls that have to be delayed, which could be completed promptly if the load was distributed properly.

When we have circuits over which the loads are equally distributed, and an operator uses an irregular route, she places a heavier load on one circuit and a light load on the other one. There is also more circuit used in an irregular route than is used in the proper one. This is another reason why we receive poorer transmission when we do not stick to the proper routes as shown in the instructions.

I do not mean to say that when we lengthen the line we get poorer transmission, for it is possible to use an iron circuit up to about 75 miles without repeaters; but after that distance, it will be necessary that the repeaters be used. Repeaters are not installed in every office, due to the cost and necessity for them; but when we have a long-haul call it is necessary that it be routed through an office where there are repeaters.

A copper circuit can be used up to about 325 miles without the use of the repeaters, as it gives a great deal better transmission than an iron circuit. It can, therefore, be seen that our long-haul call must be routed through an office where there are repeaters if it is going over more than 75 miles of iron wire or 325 miles of copper.

In the routing instructions we find a code "L. H.," which stands for "long haul," "L. H. R.," which is for "long haul repeaters," and "V. L. R.," which is for "very long haul repeaters." In passing a call it is very necessary that these codes be given to the next operator, for this will be her guide as to what circuit she should route the call over.

If the letters are left off, there will be nothing to show the next operator the kind of a circuit that is needed, and it is probable that she would use any circuit that was not in use. In most cases it would be a poor circuit, for it would be taken for granted that when there are no special instructions with the call it is only short-haul one.

Becomes Sole Owner of Warroad (Minn.) Telephone Co.

R. L. Fox, of Warroad, Minn., has purchased the interests of J. W. Jowett in the Warroad Telephone Co., with whom he has been associated many years.

This transaction dissolves one of the oldest firms in Warroad, the firm of Fox & Jowett having launched out in the telephone business by establishing the local exchange in July, 1904. In 1905 they branched out by running a line to Roseau and the same year wire was strung along the railway fence to Swift. These lines constituted the long distance service of the firm.

In 1906 a long distance line was established to Baudette, which eliminated the fence line to Swift, and a year later they bought out the local exchange at that place. In 1908 the first farmers' line to Swift was built, and in 1910 a line was erected north to the Canadian boundary where it connected with the Manitoba government's line.

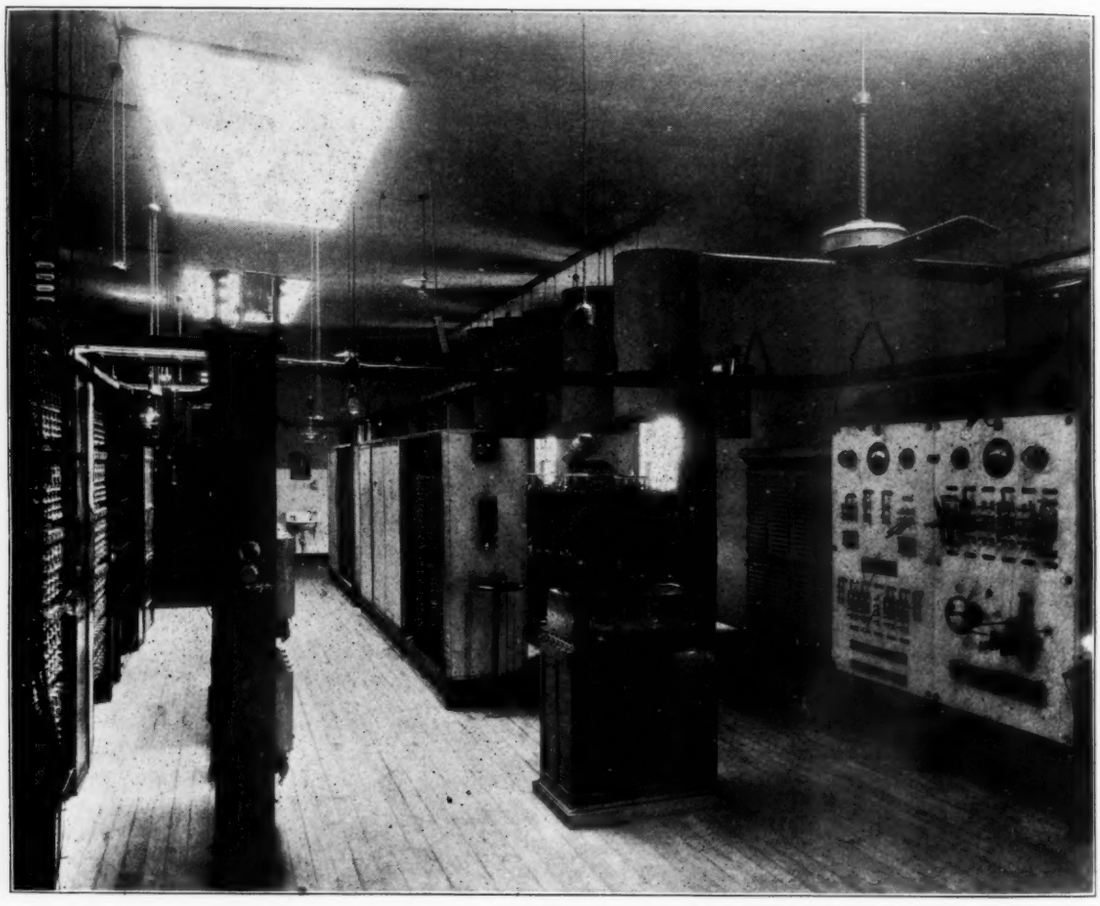
In 19 years the business, by careful management and hard work, was increased from a local exchange of 35 telephones, in 1904, with a business of about $65 per month, to a business of considerable magnitude.

Poor Wire Joints Put Telephone Patrons Far Apart.

Recent tests and demonstrations by the Southwestern Bell Telephone Co. on rural telephone lines serving the territory surrounding the city of Claremore, Okla., have shown that the owners of these lines have been cheating themselves badly by failure to maintain good wire joints on some of the lines. All lines were shown to be in need of improvement and their owners are to make the needed repairs at once.

It was demonstrated that patrons only eight miles apart were obtaining service equal to that to be expected over 50 miles of similar construction. The managers of the lines tested were shown how to improve service over their lines at practically no cost.

It was stated in connection with the same demonstration that serious loss of telephone efficiency is caused by loose ear caps on telephone receivers, it being shown that a loss of efficiency as high as 68 per cent can be caused by failure to keep these caps screwed on tightly.



The Switchroom at Richmond, Indiana, Showing Strowger Units Installed at Various Times — Some Old, Some New — but *ALL* Working Harmoniously Together and Rendering Satisfactory, Modern Telephone Service.

Mr. W. M. Bailey, General Manager of the Richmond Home Telephone Company, says: "After sixteen years' experience in the operation of the automatic plant at Richmond, I am now more than ever convinced that automatic equipment will eventually take the place of manual equipment entirely."

Strowger Equipment Is Standard Equipment

Those telephone operating managers who know Strowger Automatic through actual use almost invariably come to recognize it as standard equipment, and refuse to consider any other type for future replacements. This is not because of any engineering necessity but because of the better service rendered and the greater profits realized.

The Richmond (Ind.) Home Telephone Company, for instance, began the use of Strowger Automatic in 1907. This original equipment has been added to at various times as extensions have been required. A few years ago, all of their farm lines were converted to automatic, and later a C. A. X. (Community Automatic Exchange) was installed to replace magneto equipment at their Boston exchange.

The experience of Mr. W. M. Bailey, General Manager of the Richmond Company, is summed up in the single statement reprinted on the opposite page. Why not likewise let his experience guide and safeguard the future of ***your*** company.

Automatic Electric Company

FACTORY AND GENERAL OFFICES: CHICAGO, ILLINOIS

BRANCH OFFICES IN ALL PRINCIPAL CITIES

ASSOCIATED COMPANIES

INTERNATIONAL TELEPHONE SALES AND ENGINEERING CORPORATION, New York

International Automatic Telephone Company, Ltd., London — Compagnie Francaise pour l'Exploitation des Procédés Thomson-Houston Paris

Automatic Telephone Mfg. Co., Ltd., Liverpool. — Automatic Telephones, Australasia, Ltd., Sydney

Recent Summer District Meetings

Western Pennsylvania Telephone Men and Women Have Profitable and Enjoyable Gathering—Independents Around Waco, Texas, Send Representatives to District Meeting—Oklahoma Holds First Two of Series of Meetings

Western Division Meeting of Pennsylvania Association.

The second annual summer convention and operators' conference of the western division of the Pennsylvania State Telephone & Traffic Association was held at Conneaut Lake Park, Pa., July 25, 26 and 27.

The first session Wednesday afternoon was a joint one, addresses being given by Mrs. Mabel Pearson Sellvin, chief operator of the Jamestown Telephone Corp., Jamestown, N. Y., and H. E. Bradley, president of the association.

There were two meetings Thursday morning—one for the operators, the other for the managers. At the managers' meeting J. K. Johnston of Indianapolis, Ind., spoke on "Plant Appraisals," and H. M. Engh of the American Appraisal Co., Milwaukee, Wis., on the subject "Unit Costs."

Thursday afternoon was left open for recreation.

About 150 operators, members of the association, manufacturers' representatives and their families were the guests of the Meadville Telephone Co. at a dinner held at the Hotel Conneaut at 7 p. m. John Z. Miller, of Erie, a gifted ventriloquist, entertained for some 15 minutes. Miss Dorothy Paca, daughter of Mr. and Mrs. Wm. S. Paca of Oil City, a talented musician, gave several vocal numbers which were heartily applauded.

The dinner closed after a somewhat extended controversy regarding the secret formation of a new benevolent order in the telephone business, J. K. Johnston reading the minutes of this first meeting under protest.

It developed that the new organization is known as the Amalgamated Order of Bootleggers. Its first meeting was held at Conneaut Lake, July 25, at which time John Wright, of Jamestown, N. Y., was elected director-general. He is to have full authority over trucking, manufacturing and retailing of booze—red and white. His position in the booze industry is the same as Judge Landis holds in the baseball business, or Bill Hays enjoys with the movies.

The minutes of that meeting show that Mr. Wright in accepting the position, complimented the boys on selecting him and said he would give his whole time to the duties of his new office.

At this point, W. H. Wilson asked the privilege of expressing his views regarding bootlegging, saying he had very pronounced ideas about the business. First of all, he declared, there is too much overlapping and too much waste of fines. Territories must be assigned and production curbed. He advocated standard quarts and pints, and standard prices for red and white goods.

The director-general called for a general discussion and H. E. Bradley said that the dangerous practice of overloading overcoats must stop; the bulk excites suspicion, especially so if the bootlegger has a prison record and no known trade or occupation. He would like to see the traffic wholly within the hands of good fresh men who have never been in jail.

Ed Schade thought liquor cars and trucks should be inspected daily, as a broken spring or faulty wiring is liable to mean the loss of a valuable cargo, to say nothing about the agents out of business for a time which seriously interrupts delivery.

"None but neat-appearing solicitors should enter office buildings," said Clarence Thompson. "What we want to do is to dignify the business and rid it of all obnoxious practices. There should be certain agents assigned to hotels and others to apartment houses. It should be the duty of someone to meet all trains. A pioneer in the industry should be assigned to attend all telephone meetings and conventions."

It should be the duty of the director-general to personally inspect deliveries for city buildings and police headquarters, declared J. G. Ihmsen of New York.

"Sales under bridges and in dark stairways cause disputes and unnecessarily jeopardize the business. The habit of bootleggers drinking with their customers to prove the goods is bad form and often makes a drunkard of valuable salesmen. Every effort should be made to aid dry officers in running down and ridding the country of irresponsible bootleggers." Thus spoke Karl Schotte, of Kittanning, who never has been known to take a drink stronger than near beer.

The operators' conference on Friday morning and the executive meeting of the association at the same time, closed the convention.

The following papers were read and discussed at the operators' traffic conference:

"Completed Calls vs. Cancellations. What they mean to the subscriber and to the company." Miss Myrtle Anderson, supervising chief operator, Petroleum Telephone Co., Oil City.

"Timing and Report Charges." Miss Clarissa Young, toll operator, Peoples Telephone Co., Butler.

"The Value of System in Operating." H. O. Woodward, chief operator, Erie Telephone Co., Waterford.

"The Duties of the Toll Center." Miss Anna Curtis, chief operator, Petroleum Telephone Co., Oil City.

"Building, Clearing and Supervising Toll Circuits." Miss Eva L. Peecook, chief operator, Kittanning Telephone Co., Kittanning.

"The Responsibility of the Toll Center Line Operator," Miss Matilda Libell, service observer, Peoples Telephone Co., Butler.

"Precedence of Long Distance Calls." Miss Hazel Young, chief operator, Mutual Telephone Co., Corry.

"The Tributary Office Operator and Her Duties." Miss Marion Lacey, chief operator, Mutual Telephone Co., Erie.

"The Operator's Problems and Necessary Qualifications." Miss Ruby Tuttle, supervisor, Petroleum Telephone Co., Oil City.

"The Problems of the Small Town Operator." Miss Dorothy Northrop, operator, Mutual Telephone Co., Erie.

"Overlapping—Team Work—Coöperation." Miss Rosalie Shiber, toll chief operator, Johnstown Telephone Co., Johnstown.

"When Is a Call Considered Covered?" Mrs. Sylvia Elderbridge, chief operator, Albion Telephone Co., Albion.

"The Necessity of Ticket Detail in Handling Calls and Report Charges, in Proper Order." Miss Frances Weaver, chief operator, Meadville Telephone Co., Meadville.

"The Duties of the Recording Operator." Miss Vera Clair, chief operator, Petroleum Telephone Co., Franklin.

"The Duties of the Local Operator." Mrs. Addie A. Dean, Edinboro Telephone Co., Edinboro.

Waco District Meeting of Texas Association.

Practically every county in Central Texas was represented at the district meeting of the Texas Independent Telephone Association, held at Waco, July 18. C. A. Shock of the Grayson Telephone Co., Sherman, presided at the morning session, and R. B. Still, of Tyler, president of the Texas Independent Telephone Association, was in charge of the afternoon program.

In his address on "The Future of Independent Telephony," J. C. Paxton, assistant general manager of the Grayson Telephone Co., Sherman, declared that on January 1

of this year there were 20,850,000 telephones in use throughout the world, as compared with 12,588,000 automobiles. There were more than 14,000,000 telephones in the United States, or 13 to every 100 people. New York has more telephones than all Great Britain, Mr. Paxton said. He said that 71 per cent of the telephone exchanges in the world were privately owned.

In the last ten years the number of telephones in the United States has doubled; in the last five years there has been an increase of three quarters of a million telephones per year. At the present rate of growth, a conservative estimate places the number of telephones in the United States in 1940 at 25,000,000.

The next speaker was George McQuaid, of Dallas, director of the Texas Public Service Information Bureau, whose subject was "Getting the Facts of Your Business to the Public."

"The public utility," said Mr. McQuaid, "has only one thing to sell—its service. The newspaper has only one thing to sell—its circulation. The people look to the utility for service. They look to the newspaper for news—and business news in the form of paid advertisements is just as important as the other news.

"In their work of informing the people about their service, public utilities can not afford to neglect either of these news services. The successful business man in your town buys advertising space to tell the people about his business—to create good will and get satisfied customers. The successful public utility does the same thing."

Following Mr. McQuaid, D. H. Walters, manager of the Texas Telephone Co. at McGregor, spoke on "How I Would Manage My Own Exchange." He emphasized four things in his address: the proper public relation to friendship, the keeping of a set of books and records giving at all times the exact details of the business, a well-defined set of rules and regulations, and the rural line situation in regard to the individual exchange manager.

Sam H. Shutt, general superintendent of the Texas Long Distance Telephone Co. delivered the last speech on the program for the morning on "Increasing Toll Revenue."

As guests of the association, a luncheon was enjoyed by practically all of the 74 men and women registered. R. W. Garner, plant superintendent of the Texas Telephone Co. had the luncheon in charge, and it was served in the ball room of the Raleigh. There are 139 telephone companies in the Waco district, comprising practically all of Central Texas.

The other speakers and their subjects were: J. W. Davis, vice-president and sales manager of the Meadows Grocery Co., Waco, "Telephone Service in Present-Day Business"; R. W. Garner, plant superintendent of the Texas Telephone Co., Waco, "Proper Methods of Plant Maintenance"; R. B. Still, president of the Texas Independent Telephone Association, Tyler, "Financing Independent Telephony in Texas"; C. D. Kinne, Stromberg-Carlson Telephone Mfg. Co., Dallas, "Proper Care of Storage Batteries"; L. E. Ponder, assistant auditor of the Texas Telephone Co., Waco, "The Necessity for Proper Accounting Records."

District Telephone Meetings of Oklahoma Utilities Association.

The second annual conventions of the first and second districts of the telephone division of the Oklahoma Utilities Association were held at Broken Arrow and Quinton, Oklahoma, on July 19 and July 21 respectively. These districts comprise 16 northeastern counties of Oklahoma. About 100 telephone company executives and representatives attended these conventions. Practical problems and public relations were the chief subjects for consideration in the addresses and papers on the programs.

The 1924 convention of the first district will be held at Wynona in Osage County under the direction of E. H. McHenry of Wagoner, and Mrs. C. O. White of Wynona, who were elected chairman and secretary respectively of the first district at the Broken Arrow meeting.

The second district convention of 1924 will be at Heavener in LeFlore County. A. W. Cook of McAlester was elected chairman, and Miss Eddie McBryar of Heavener, secretary of the second district, at the meeting at Quinton.

J. W. Walton, chairman of the telephone division of the Oklahoma Utilities Association, announces further district conventions for this year as follows: September 6, District No. 3 at Durant; September 11, District No. 4 at Oklahoma City; September 18, District No. 7 at Carnegie; September 20, District No. 6 at Frederick; October 2, District No. 5 at Kingfisher; and October 4, District No. 8 at Woodward.

Plans for Taking Over European Telephone Systems.

The International Telephone & Telegraph Corp., now negotiating for the telephone systems of France and several other European countries, has outlined its plan for taking over these lines. The proposals are being made, it is learned, in conjunction with bankers and the manufacturers of telephone equipment in the United States.

To date the negotiations, according to the statement issued by the company, are either for the reconstruction or both the reconstruction and operation of the European systems.

In case these negotiations are successful the company says it will continue "to follow the plan of financial organization so successfully applied by the American Telephone & Telegraph Co. in the United States."

"It is the purpose of the International corporation, in general," the statement continues, "to own and operate its international long distance telephone system and to hold all, or a controlling interest in, the common stock of each subsidiary company. It will furnish engineering, operating and other advice and assistance to such companies under appropriate management contracts.

"In addition, it will maintain for these companies a consolidated purchasing and supply organization, thus securing substantial economies in the cost of supplies and equipment."

Should the negotiations for the French or other systems be successful, the plan of operation, as outlined by the company, would be as follows:

"The policy of the International corporation, in both existing and proposed operations, has been to organize each subsidiary telephone system on a thoroughly national basis, with local directors and operating officials, of which a large majority shall be citizens of the countries in which service is rendered.

Engineers and technicians, on the other hand, have been and will be largely drawn from those having long experience with American telephone practice, supplemented by the development of qualified technicians from among the local operating forces."

This plan, it is said, already has proved a distinct advantage in the negotiations for the taking over and modernization of existing telephone companies in the areas in which it is proposed to conduct operations.

Besides the negotiations for the European telephone system, the company, according to an announcement it made some time ago, is contemplating an extension of its lines to South America under a somewhat similar plan.

New England Striking Operators Back at Work.

The strike of telephone operators in New England was declared off, effective at 3 p. m., July 26, by Julia S. O'Connor, president of the telephone operators' department, International Brotherhood of Electrical Workers, at 1 o'clock that day. Miss O'Connor was leader of the strike, which had been in force since June 26 for a seven-hour day and higher wages in all New England states except Connecticut.

The striking Boston operators voted almost unanimously in favor of accepting the recent offer of the New England Telephone & Telegraph Co. to reinstate operators as individuals with the loss of their seniority rights, it was stated.

Private Communication Systems

An Oil Company's Extensive Private Communication System.

Several of the large oil companies operating in the Mid-continent field have communication systems, some telephone and some telegraph, but the Empire companies using the combination of telephone and telegraph are said to have the largest private system in the field.

Few people realize the magnitude of the private telephone and telegraph system of the Empire companies. To take down the receiver of a telephone in the Bartlesville, Okla., office and call practically any of the companies' field offices or stations, or write a telegram and have an answer immediately from Kansas City, Mo., Duncan, Okla., or Gainesville, Texas, is taken as a matter of course.

This private telephone and telegraph system was started in 1913. At that time the gas division was greatly in need of a means of reliable telephone communication to order wells turned in, gates closed, and other general business which had to be handled between the general offices at Bartlesville, Okla., and the North Osage gas field.

In handling the North Osage field in the early days, it was the practice to place a long distance call over the Bell lines to Elgin, Kan., which was connected with the field by a rural line. After getting in touch with the terminal point, it was necessary to send word to the field man by messenger to come to the telephone station to receive instructions for the following day, or often a longer period.

To complete such a call required several hours and during bad weather it was practically impossible to get connections as the lines around Elgin were poorly constructed and had very little maintenance. This service was so uncertain and unsatisfactory that eventually a contract was let to construct a line from Caney to the North Osage field. This was the beginning of the up-to-date system which the Empire companies now have. Small pole leads were later constructed by the Empire for limited telephone service only.

The full value of private telephone and telegraph service was now realized and during the winter of 1916 a program for a more elaborate system was started. Beginning in 1917 the system grew with rapid strides, lines being built to practically all fields of development.

During the early days of the El Dorado field, men and materials were rushed to the scene of operations with instructions to get communication service established in keeping with development and production requirements. This was done by stringing wires on derricks and houses. Later well constructed pole leads were built as rapidly as possible to insure service without interruption.

A means of communication in such instances as these meant the placing of the Empire ahead of competitors, and the rapidity with which pipe line and the storage facilities were provided resulted in increased production and earnings for the company.

The operation and maintenance of this system is on a high plane, as has been reflected several times when emergencies have required quick work on the part of this department to restore communication to a devastated property.

One particular instance was in December, 1919, when the plant of the Cottonvalley measuring station, the main gas lines feeding through this plant, and the telephone equipment and wires at this point, were destroyed by fire. Among the first to reach the scene of disaster was the manager of the gas division, who after summing up the situation, asked, "Where can I go to get in touch with Bartlesville?"

It so happened that he addressed a troubleman, who replied, "there is a telephone," pointing to a pole where he had already provided for temporary service by placing a telephone. Because of the questioning look on the manager's face, the troubleman added, "I guess I came on ahead of you." This spirit prevails among the troublemen of this department, for they are usually among the first to arrive on the job wherever emergency communication is concerned.

Another occasion worthy of mention was during the summer of 1922 when a terriffic windstorm destroyed many derricks and buildings and caused a total failure of all private and commercial lines of communication in the El Dorado field. Temporary service was restored on the Empire telephone lines some 18 hours after the storm had subsided and several hours before other companies were able to get information through.

The purchasing agent at Bartlesville was able to find out just what was needed and bought up all the available lumber, rig timbers and steel derricks, so that the Empire properties were the first to be rebuilt and back to normal operations again. In fact other companies that suffered from the storm found that by the time they had invoiced their losses and replacement requirements, the available material had been spoken for sometime previous by the Empire companies.

The private system of the Empire connects 19 telephone switchboards and 450 field telephones. There are 21 telegraph offices for the transmission of company business. Also, the Bartlesville office is equipped with an automatic telephone exchange of 200 lines' capacity which is so entirely automatic that it is uncanny. The charging of the batteries which are necessary to this exchange is handled automatically, the power and ringing machines starting up automatically. A paging device enables one to locate parties although they are not at their own telephones, and conference trunks save department heads many steps, as conferences can be held via the automatic by having all parties concerned dial a certain number at an appointed time.

The Wichita Falls, Texas, office of the company is to be connected with the present system by a telephone circuit between Wichita Falls and Burkburnett according to a recent announcement. This will give the Wichita Falls office telephone communication to Duncan, Waurika, Healdton and Gainesville, and telegraph service over company wires to Bartlesville, Wichita, and all points on the system in Oklahoma, Kansas and Missouri.

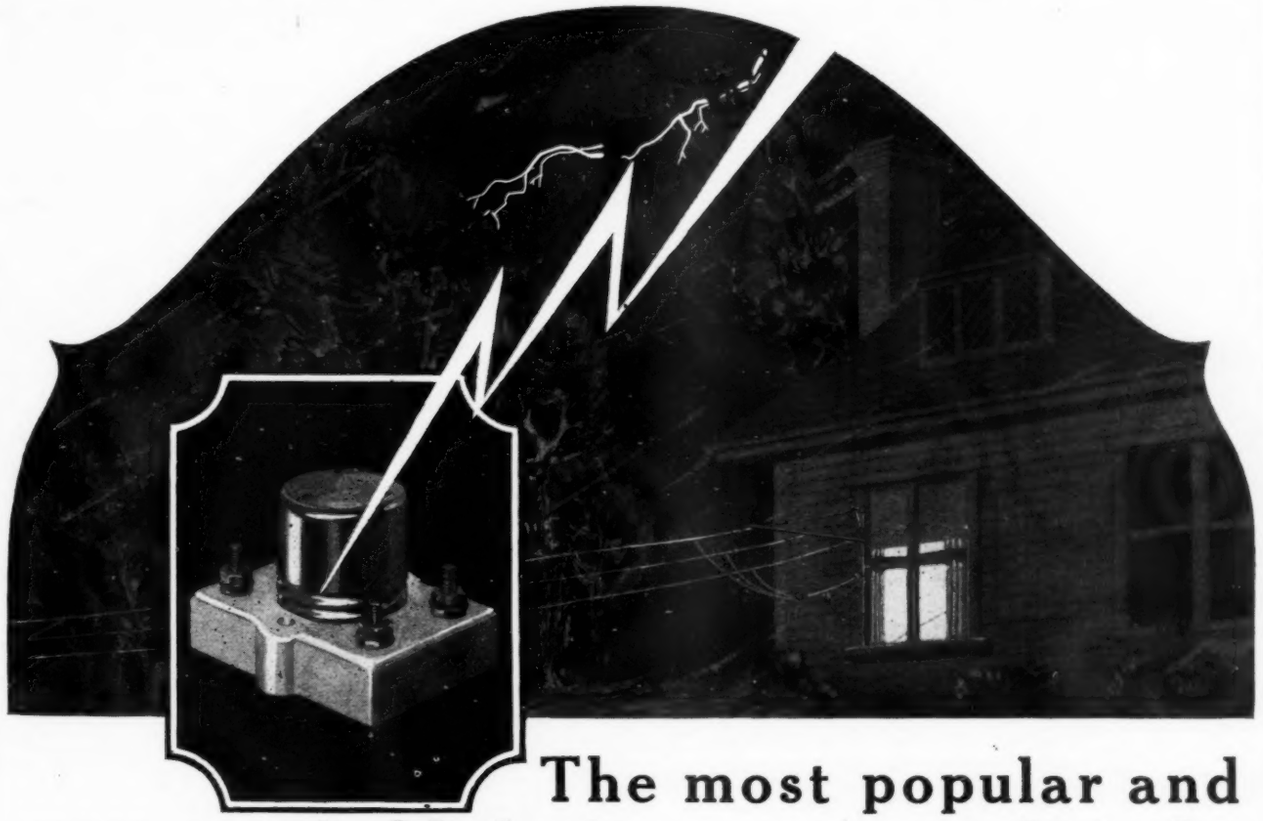
The telephone and telegraph department ranks high in having a well-trained, harmonious working organization under the able supervision of Fred B. Seem, superintendent, who has been in this capacity since the fall of 1916. We do not know how long Mr. Seem has been doing practical telephone and telegraph work but he was recently made a member of the Independent Pioneer Telephone Association of the United States.

Telephone System of Southern Paeific Railroad on Pacific Coast.

The Southern Pacific Railroad Co. has recently completed a telephone circuit between San Francisco and Los Angeles, via the Valley route, which admits of the Southern Pacific telephone exchanges and their associated lines at West Oakland, at 65 Market street and at Third Street Passenger Station in San Francisco, Bayshore terminal, San Jose, Stockton, Fresno, Sacramento, Roseville, Reno, Sparks and intermediate points securing connections to Bakersfield and Los Angeles, and vice versa.

In addition to this, both the Valley and Coast line routes between San Francisco and Los Angeles are now completely equipped with selective ringing telephone train dispatching circuits. Altogether the company has 2,922.5 miles of selective ringing, dispatching circuits on the different divisions.

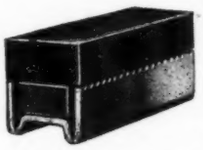
In addition to the selective ringing dispatching circuits the company also has communicating telephone circuits for gen-



The most popular and most practical lightning arrestor made is the

FROST-RADIO PROTECTOR

THE tremendous nation-wide demand for the FROST-RADIO PROTECTOR is founded upon the bed-rock of a *practical* lightning arrestor, distributed by the country's leading jobbers and sold at a popular price. No wonder radio fans everywhere have bought this protector from their dealers to the number of many thousands each month.



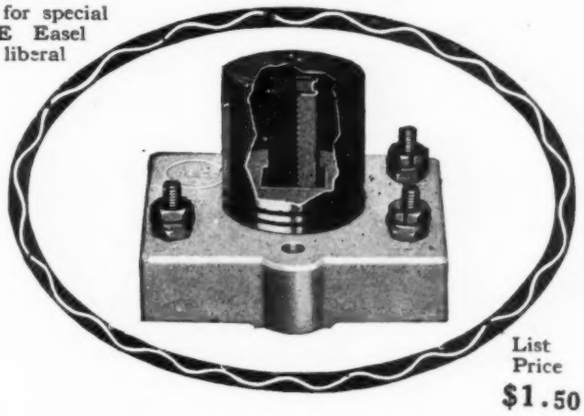
Note the close spacing of protector elements in accordance with new rules

Study the picture of the Frost-Radio Protector element, with its self-cleaning "saw-tooth" construction. After fusion under discharge of atmospheric electricity the metal teeth pull away from the carbon block on cooling. Simplest and best of all protectors.

Practical because made according to correct telephone practice

In designing the FROST-RADIO PROTECTOR the Reliable Electric Company has embodied their first hand knowledge of lightning arrestor design and construction gained during many years of experience in the telephone field. The "saw-tooth gap"—the self-cleaning feature—simplicity and high quality of materials—all combine to make the FROST Protector the most practical radio arrestor on the market.

JOBBERS: Write for special FREE Easel Display Panel Offer and our liberal dealer co-operation.



List Price **$1.50**

Reliable Electric Company

3145 Carroll Avenue, CHICAGO, ILLINOIS

eral business covering a distance of 1,836 track miles. The company now has 17 telephone exchanges on its Pacific system employing a total of 82 telephone switchboard operators.

The Southern Pacific company's Pacific system pioneered in the use of simultaneous telephony and telegraphy. The first selective ringing telephone train dispatching circuit upon which a long-haul multiplex telegraph circuit was superimposed using the same wire was placed in service on the main line of the Salt Lake Division between Sparks, Nevada, and Imlay, Nevada, on September 4, 1912. This circuit carried, at that time, a San Francisco-Omaha multiplex circuit, and today it carries a San Francisco-Ogden printer circuit.

Since this installation, all selective ringing telephone train-dispatching circuits, as well as conversational telephone circuits, carry a telegraph circuit, either single Morse, polar duplex, quadruplex or printer. Such simultaneous use of the facility does not in any way lessen the volume or impair the clarity of the speech transmitted, nor affect the calling of the intermediate way stations selected. This simultaneous use makes possible large savings in outside wire plant investment.

On the selective ringing telephone train-dispatching circuits provision is made for selectively calling the different stations along the line by the use of the step-by-step mechanism which responds to a certain number of pulsations or combination of pulsations sent over the line, making it possible to arrange a large number of selective combinations, and thereby signal any station at will, without disturbing the others.

At stations along the line a special form of telephone set is installed for the use of the operators. These sets have certain combinations of apparatus and wiring that provide a so-called "booster" effect in transmission.

When more than the calling and the called telephone stations come into the average circuit, the tendency is to reduce the efficiency of the wire. This renders conversation indistinct to the station at the greatest distance from the speaker. The effect of the "booster" device is to maintain the efficiency of a telephone circuit regardless of the number of stations using it at the same time. This enables either one or a dozen operators along the train-dispatching circuit to hear with equal ease and accuracy the orders from a distant dispatcher.

By "simplexing" a considerable amount of its existing telegraph lines this company was enabled to provide itself with a comprehensive territorial telephone system, whereby San Jose, Stockton, Fresno, Sacramento, Reno, Sparks, Santa Cruz and similar points can obtain direct telephone connection with the Pullman reservation chart room at 50 Post street, San Francisco, and secure instantaneous allotments of space for waiting passengers; get freight rate information from the freight traffic department for patrons, or get in touch with other departments.

Likewise, Pasadena, Duarte, Colton, Long Beach, San Pedro, Santa Barbara, Bakersfield and Fresno are able to reach over company lines the Pullman chart reservation forces in the Pacific Electric Building, Los Angeles, and from them secure almost instantly the sleeping car space that may be desired by prospective passengers.

In cases where there are two pairs of telephone wires in a district and they are located either adjacent on the same cross-arms, or occupy vertical positions, it is possible to obtain a third circuit—a "phantom circuit." Conversation can go on over a phantom circuit without disturbing, or being disturbed by simultaneous conversations over the two metallic circuits from which the phantom circuit is formed. Such circuits are now in use between Los Angeles and Bakersfield, Stockton and Fresno; Oakland and Stockton; San Francisco and Sacramento; and Niles and San Jose.

Leviathan Has Telephone Connections When at New York Dock.

When the Leviathan went into transatlantic service on July 4, the vessel had the distinction of being the first ocean liner to be completely equipped with an intercommunicating telephone system, which, when the liner is in its dock, will be connected with the New York Telephone Co.'s system in the city, making available to persons on shipboard telephone connections with any points in the nation-wide Bell system.

The big ship's telephone system was installed as a part of the fitting-up process when the liner was in drydock in Newport News, the work being done under the direction of the Western Electric Co., whose standard telephone apparatus was used. The heart of the system is a three-position private branch exchange switchboard which serves 600 telephones placed in cabins and throughout the ship's establishment. In making the installation it was necessary to use an especially constructed heat-resisting cable because of the intense heat in some parts of the ship below decks, particularly in the vicinity of the engine room.

As soon as the liner is alongside of her berth in New York City the switchboard will be connected to the general exchange system through the Lackawanna central office. On days of sailing to foreign ports, this telephone service will be maintained until the moment of departure.

Although telephone communication between the telephone system on shore and private systems on shipboard has been used on a small scale before, nothing so elaborate as the Leviathan's facilities, with connections with the entire Bell system, has ever before been attempted.

Standard Telephone Equipment for Government Departments.

The chief of the telephone section of the United States Bureau of Standards has been appointed chairman of a committee of various department representatives designated to consider for the Federal Specifications Board the desirability of preparing standard government specifications for the purchase of telephone equipment.

A preliminary meeting of this committee has disclosed the fact that the government owns and operates a large number of small telephone systems using equipment of various types and manufacture. The annual expenditures for replacement and additions, estimated on the present quantity of material in use, warrants the preparation of standard specifications for purchase, and the Federal Specifications Board has been so informed.

U. S. Government Has Positions Open for Radio Engineer.

The United States civil service commission announces that it has positions open for a radio engineer, an associate radio engineer, and an assistant radio engineer, for which applications may be filed up to October 30.

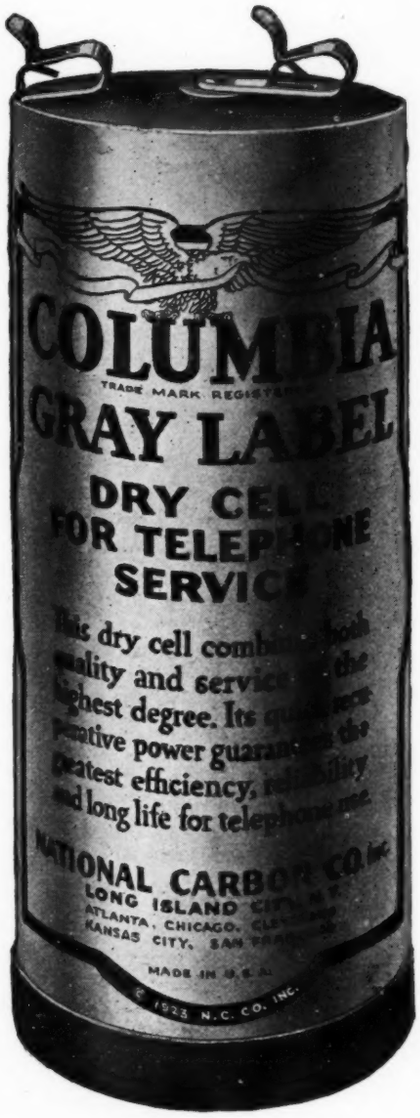
The duties are to superintend the design, construction, standardization, and the writing of specifications for practical and special radio apparatus—the apparatus to include sets for land use for more or less permanent stations, also for portable land stations, for airplane and ship sets, and similar lines of work.

The first position pays a salary of $4,000 to $5,000 a year; the second, $3,000 to $4,000; and the third, $2,000 to $3.000.

Competitors will not be required to report for examination at any place, but will be rated on education, experience and fitness. Complete information and application blanks may be obtained from the commission at Washington, D. C., or from the secretary of the board of United States civil service examiners at the post office or customhouse in any city where the civil service has an office.

Prices in the Metal Markets.

New York, July 30.—Copper—Steady; electrolytic, spot and futures, 14⅝@14¾c. Tin—Firm; spot and futures, $39. Iron—Steady; No. 1 northern, $26@27; No. 2 northern, $25@26; No. 2 southern, $24@27. Lead—Steady; spot, 6.50c. Zinc—Firm; E. St. Louis, spot and nearby delivery, 6.30@6.35c. Antimony—Spot, 7.45@7.55c.



Columbia Telephone Batteries are unlike humans—these Gray Labels, for example, eat only while they work. While the receiver's hung up, they quit. The net result is that they conserve their stock of food—and cost less per month of service. Fahnestock Spring Clip Binding Posts at no extra charge.

NATIONAL CARBON COMPANY, INC.
Long Island City, N. Y.

Atlanta Chicago Cleveland
Kansas City San Francisco

Columbia Telephone Batteries

"less cost per month of service"

Financial Statements and Reports

Statistics of Class A Companies Compiled by the Interstate Commerce Commission—Financial and Operating Data Regarding Nebraska Telephone Companies—Mutual Telephone Co. of Erie, Pa., Reports on 25 Years of Growth

Summaries of Reports of Class A Companies for April.

The operating revenues of the 70 Class A telephone companies filing reports with the Interstate Commerce Commission for the month of April amounted to a total of $53,603,816—an increase of almost 12 per cent over the revenues for April, 1922. The average increase for the first four months of this year has been 11.7 per cent over that of the same period last year. These figures are reflected in the statement compiled by the commission's bureau of statistics.

Operating expenses for the month were 9.7 per cent higher than for April of last year, and were 8.6 per cent higher for the four-month period. Traffic expenses were 9.1 per cent more for the month.

The advance in net operating revenues for April, while good, was a little less than the average for the four months—17.2 per cent as compared with 19 per cent. Taxes assignable to operations showed an advance of 18.6 per cent during April and 17.4 per cent during the four-month period.

Operating income for April was 16.3 per cent greater than that for April, 1922.

Statistics of Nebraska Telephone Companies.

The summary of reports of telephone companies' returns for the year 1922, just issued by the Nebraska State Railway Commission, shows that only 57 of the 220 reporting paid dividends for the year. Fifty-seven of the companies were in the red after they paid their interest due and 37 of them lacked enough revenue to pay any interest whatever.

The report of the Northwestern Bell company was made for the entire district that it covers, and only a part of the figures for its Nebraska business are available for the totals. Including the $18,352,217 reported as the book cost of the Bell company, the total book cost for all of the companies is $32,269,258, which is 13 millions more than in 1913.

In the last ten years the operating revenues of all of the companies, including the Bell, have grown from $4,564,159 to $8,797,236, while the operating expenses, not including dividends and interest, between 1913 and 1923 inclusive, increased from $3,610,370 to $7,263,298. Northwestern Bell dividends were not included in the totals of $494,996, but of this sum $407,885 was paid by the Lincoln company, leaving only $87,000, in round numbers, for the other companies. Figuring on the $4,522,000 of book cost of property for all companies except the two big ones, this indicates that outside of the Lincoln and Northwestern the other companies earned a little less than 2 per cent on the investment.

In the ten-year period just closed, the capital stock of all the companies, except the Bell, has increased from $7,528,000 to $9,497,992, while the bonded indebtedness has gone from $2,000,000 to $2,214,559. Surplus and undivided profits for the same companies have decreased from $2,070,000 to $1,323,273.

The net earnings of all of the companies, except the Bell, before interest and dividends were deducted, were $1,533,953 in 1922 and $686,000 in 1913.

In the ten years the number of stockholders, including the Bell with its 13 at present, has decreased from 21,474 to 19,988 in 1922.

The number of stations served, including the Bell figures, have increased from 152,516 to 243,369. The cities and villages show most of the increase. Farm telephones have increased from 56,137 in ten years to 69,810, and city and village telephones from 96,379 to 173,559. Over 10,000 farm lines are now switched by the companies.

The largest increases in the number of stations are shown by the Bell, largely in Omaha, and the Lincoln companies, the former going from 64,795 in 1913 to 101,580 in 1922, and the latter from 43,240 to 67,710.

The following figures for 1922 do not include any returns from the Bell: Depreciation reserve, $2,839,698; book depreciated value, $11,757,342; capital stock, $9,497,992; notes and bonds, $2,214,549; total capital liabilities, $11,712,451; surplus and undivided profits, $1,323,273; interest accrued, $147,642; rural circuits, 3,260; miles of wire, 250,181.

The Lincoln company's figures follow: Book cost, $9,385,602; depreciation reserve, $1,524,781; depreciated value, $7,860,821; capital stock, $6,802,713; bonds, $1,500,000; capital liabilities, $8,302,713.50, on which it paid interest and dividends of $495,368, or an average of a little less than 6 per cent; surplus and undivided profits, $521,508; operating and other revenues, $2,421,082.71; paid in interest, $87,368;

Item.	For the month of April		Increase or decrease (*)		For the four months ending with April.		Increase or decrease (*)	
	1923.	1922.	Amount.	Ratio Pct.	1923.	1922.	Amount.	Ratio Pct.
Number of company stations in service at end of month	10,790,975	10,018,853	772,122	7.7				
Revenues:								
Subscribers' station revenues	$34,494,102	$31,235,489	$3,258,613	10.4	$135,062,144	$123,408,397	$11,653,747	9.4
Public pay station revenues	2,417,624	2,185,483	232,141	10.6	9,574,416	8,535,169	1,039,247	12.2
Miscellaneous exchange service revenues	447,308	402,213	45,095	11.2	1,755,577	1,676,151	79,426	4.7
Message tolls	13,809,254	11,940,163	1,869,091	15.6	54,627,102	46,493,711	8,133,391	17.5
Miscellaneous toll line revenues	1,487,782	1,339,126	148,656	11.1	5,920,921	5,382,356	538,565	10.0
Sundry miscellaneous revenues	945,781	793,123	152,658	19.2	3,779,364	3,186,007	593,357	18.6
Licensee revenue—Cr.	1,901,205	1,708,613	192,592	11.3	7,736,800	6,937,615	799,185	11.5
Licensee revenue—Dr.	1,900,240	1,707,013	193,227	11.3	7,732,782	6,937,398	795,384	11.5
Telephone operating revenues	53,602,816	47,897,197	5,705,619	11.9	210.723,542	188,682,008	22,041,534	11.7
Expenses:								
Depreciation of plant and equipment	7,785,133	7,034,859	750,274	10.7	30,726,322	27,802,597	2,923,725	10.5
All other maintenance	7,642,026	6,665,423	976,603	14.7	29,226,007	26,463,849	2,762,158	10.4
Traffic expenses	14,366,515	13,164,619	1,201,896	9.1	56,216,358	51,898,612	4,317,746	8.3
Commercial expenses	4,697,637	4,417,260	280,377	6.3	18,548,079	17,628,438	919,641	5.2
General and miscellaneous expenses	2,386,414	2,341,060	45,354	1.9	9,652,945	9,129,417	523,528	5.7
Telephone operating expenses	36,877,725	33,623,221	3,254,504	9.7	144,369,711	132,922,913	11,446,798	8.6
Net telephone operating revenues	16,725,091	14,273,976	2,451,115	17.2	66,353,831	55,759,095	10,594,736	19.0
Other operating revenues	369	712	*343	*48.1	1,633	3,566	*1,933	*54.2
Other operating expenses	1,935	635	1,300	204.7	8,788	5,838	2,950	50.5
Uncollectible operating revenues	308,052	232,057	75,995	32.7	1,256,313	900,058	356,255	39.6
Operating income before deducting taxes	16,415,473	14,041,996	2,373,477	16.9	65,090,363	54,856,765	10,233,598	18.7
Taxes assignable to operations	4,242,331	3,576,305	666,026	18.6	16,864,854	14,367,610	2,497,244	17.4
Operating income	12,173,142	10,465,691	1,707,451	16.3	48,225,509	40,489,155	7,736,354	19.1
Ratio of expenses to revenues, per cent.	68.79	70.19	*1.40		68.51	70.45	*1.94	

April Statistics of the 70 Class A Telephone Companies Which Report to the Interstate Commerce Commission.

Klein Belts and Safety Straps Will Stand a Ton of Dead Weight!

Price is a minor consideration where life is concerned—yet, though Klein Safety Straps and Tool Belts will stand a ton of dead weight, even though they are fitted with solid steel drop forgings at D rings, snaps, and buckles, and are made from only the best quality oak tanned harness leather, cut from the back of selected hides—Klein Safety Straps and Tool Belts are still sold at reasonable prices.

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dividends, $407,885; profit and loss, $94,-334; stockholders, number, 1,914; number of stations, 67,710; number switched, 1,765; miles of wire, 135,141.

Fifteen of the 220 reporting companies have in excess of 1,000 telephones each. These are: Bell, 101,580; Lincoln, 67,710; Monroe, 3,094; Platte Valley, 3,088; Southeast Nebraska, 2,311; Kearney, 2,248; Platte County, 1,965; Glenwood, 1,738; Hamilton County Farmers, 1,553; Farmers of Dodge County, 1,492; Farmers & Merchants of Alma, 1,404; Nuckolls County, 1,194; Crete, 1,181; Blair, 1,173; Farmers Home, Gibbon, 1,003.

Some of the smaller companies did not report, but of those which did, the following figures show the number of stations served: Less than 100 stations, 28; between 100 and 300 stations, 84; between 300 and 500 stations, 53; between 500 and 700 stations, 14; between 700 and 1,000 stations, 7.

Mutual Company of Erie, Pa., Has Good Year.

At the annual meeting of the Mutual Telephone Co., Erie, Pa., held July 24, reports were read that indicated one of the largest years in the history of the company. Thirteen hundred and fifty new telephones were added to the Erie exchange, bringing the number of telephones in Erie July 1, 1923, to 15,443. The growth is 2½ times that of last year, and indications point to a still larger growth for the year to come.

President A. A. Culbertson spoke, among other things, of the faithfulness and capability of the employes, and mentioned the fact that a large majority of them are stockholders of the company.

The treasurer, A. W. Hayes, read his report in which the growth of the company was reflected by the increased receipts over last year's business.

The result of the election was the choice of the former board of directors, as follows: A. A. Culbertson, J. C. Spencer, A. W. Hayes, James Burke, James Russell, E. P. Selden and John Z. Miller.

General Manager John Z. Miller, in his report, said:

"The Mutual Telephone Co. celebrates this year its silver anniversary. It points with pardonable pride to a growth in Erie, during 25 years, from nothing to the largest telephone exchange in Pennsylvania outside of Philadelphia and Pittsburgh.

A quarter of a century ago a group of business men met at the old Board of Trade to discuss the telephone situation. There were at that time less than 500 telephones in Erie and the business rate was $75 per year. That was the first of many meetings and much investigation, which finally resulted in the organization of the Mutual Telephone Co.

The first president of the company was Hon. J. F. Downing, and secretary, W. Chase Adams. After a year, Mr. Downing resigned and was succeeded by Wm. B. Trask, with George Burton as secretary. Mr. Trask's keen foresight and business ability laid a strong foundation for the success and growth of the company.

He was president for 18 years and was succeeded by Dr. Geo. B. Kalb, who moved from the city two years later. A. A. Culbertson has filled the office of president most efficiently since 1917, a period marked by the largest growth and expansion of the company.

The gain in telephones during the year was 1,350, bringing the number in Erie to 15,443 on July 1. There is every reason to believe this rate of growth will continue throughout the year to come.

The most important step taken by the company since the installation of the automatic was the purchase of a lot on East Tenth street, adjoining the rear of our main building, for the purpose of erecting a new office and exchange. This lot has a frontage of 100 feet on Tenth street and of 40 feet on French, and cost us $90,000. It is ideal for our purpose in location, size and proximity to the present exchange. Our present building has become crowded and more room is constantly in demand; besides, the construction is not fireproof.

Our directors, with commendable foresight, are planning a home for the Mutual adequate to care for its needs for 25 years to come, housed in a building that will be a credit to the city. We live in a rapidly-growing community and we must plan far in advance to meet the demands of the city and adjacent territory for the best possible telephone service.

A lot was purchased also for another branch exchange at Twenty-sixth and Ash streets. Demands for service in this section require the erection and equipping of this sub-exchange this fall. The total expense will be about $60,000.

After much labor with the city council, they have finally decided to go ahead this summer with the building of very much needed extensions to the street conduits for our cables.

Last Thursday we held the annual picnic of our employes and their families, which was attended by nearly 300 men, women and children. The annual banquet for employes only was held in April. These annual affairs add greatly to the friendliness and good feeling among the employes and help materially to build up the morale of the organization. Our low labor turnover speaks well for the contentment of our Mutual family.

A contract was made recently with the Western Union Telegraph Co. that means an enlarged service to our subscribers. Telegrams may be telephoned to the Western Union Telegraph office from any Mutual telephone, and, for the convenience of the subscribers, the bill for the telegrams is added to the telephone account and collected by us.

One of our most valuable assets is the good will of the public. We have endeavored to take our subscribers into our confidence. We want them to realize and believe that we are here to give them the very best possible telephone service at reasonable rates.

Judging from the many expressions of satisfaction, we have every reason to believe that this confidence is appreciated and reciprocated, and we are using our best efforts to merit their good will and to increase it."

Comparative Statement of Keystone Company (Pa.) for May.

The month of May was a good one for the Keystone Telephone Co., of Philadelphia, Pa. It had a balance of $22,875 available for dividends, surplus and reserve—about $11,000 more than the balance for May, 1922. The total balance for the first five months of the year showed an increase of about $35,000 over that for the first five months of last year.

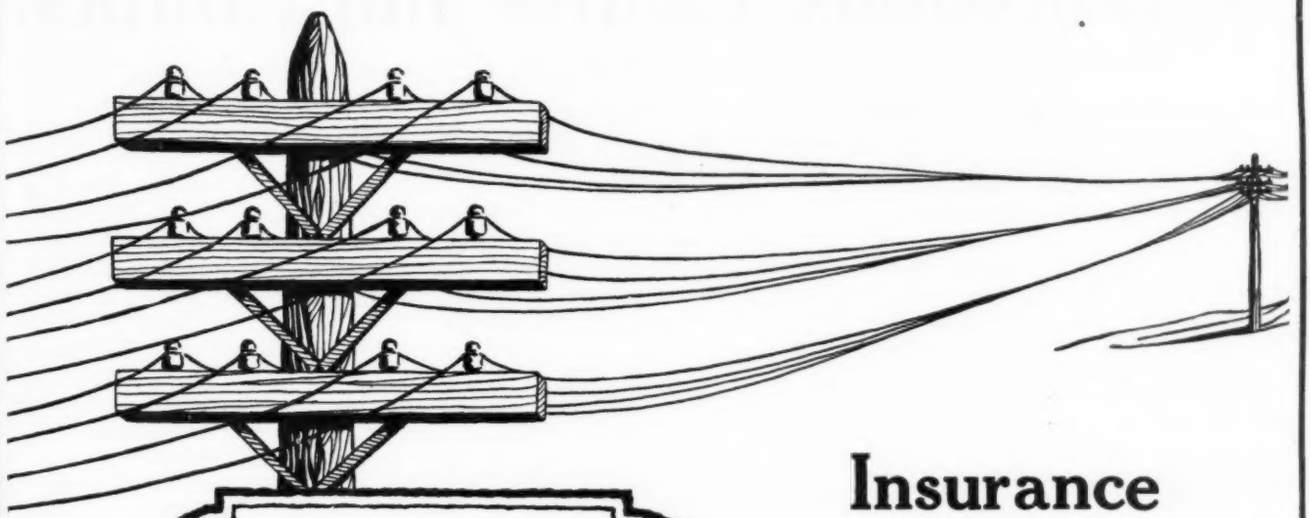
The gross earnings increased $12,600 for May and $40,500 for the first five months—over the same periods in 1922. There was a slight decrease in operating expenses this year.

The statement comparing figures for the two years follows:

	For month ended May 31, 1923	Year previous
Gross earnings	$148,500	$135,874
Operating expenses and taxes	82,776	83,597
Net earnings	$65,724	$52,277
Less interest charges	42,848	40,515
Bal. available for dividends, surplus and reserve	$22,876	11,762
	For 5 months ended May 31, 1923	Year previous
Gross earnings	$729,363	$688,807
Operating expenses and taxes	410,467	415,542
Net earnings	$318,896	$273,265
Less interest charges	217,060	206,257
Bal. available for dividends, surplus and reserve	$108,836	$67,008

Illinois Bell Approves Over Half Million Plant Expenditures.

At its July meeting, the executive committee of the Illinois Bell Telephone Co. approved an expenditure of $424,491 for new plant in the city of Chicago, and $158,-075 for Illinois outside of Chicago, making a total of $582,566. The total approved this year is $9,220,301.



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Commissions, Courts and Councils

Discussion and Rulings of State Bodies Having Supervision Over Telephone Companies—Decisions of Courts in Matters of Interest to Public Utilities and Actions of City Councils Relative to Franchise, Rates and Service

Comparisons of Operating Expenses in Nebraska Bell Case.

Strenuous objections were entered by the Northwestern Bell Telephone Co. at the rate case hearing in Omaha, Neb., before a federal court master in chancery to the introduction by the state railway commission of comparisons of expenses of giving telephone service. The commission's expert, O. E. Johnson, had taken from the books of the Lincoln Telephone & Telegraph Co. a comprehensive list of costs and offered these in comparison with those of the Bell, which, in each case, rank much higher.

The objection by Bell attorneys was that they had had no opportunity to examine the men who had made the entries from which the expert took his summaries, and that this destroyed its value as testimony. The state commission attorney agreed that this was a sound objection and offered, if the hearing were adjourned to Lincoln, to call witnesses and compel the production of books to substantiate the showing.

While the master was debating with himself whether to do this, the Bell reversed itself and so did the commission. The Bell attorneys said they would withdraw their objections, and the commission attorneys insisted that the best evidence was that of the records themselves and of the men who made them. The matter was dropped there and Mr. Johnson was permitted to proceed.

The object of his testimony, the commission's attorney explained, was to show that on a schedule of rates materially lower, exchange for exchange, than those that the Bell complained was confiscatory, the Lincoln company was able to pay dividends that had placed the common stock of the company slightly above par. The Lincoln company, he added, was giving as good service as the Bell.

Mr. Johnson desired to submit this in support of the claim of the commission that the Bell is not economically managed, that it is wasteful and extravagant in the payment of salaries and maintains an unnecessarily large number of employes in the various departments. All of these are reflected in rates that the public must pay. The commission's position is that it has a right, in making rates, to take into consideration whether a public utility plant is economically managed. This testimony was to substantiate this contention.

The comparison submitted by Mr. Johnson was for a number of exchanges, all of them outside of Lincoln and Omaha, which it was admitted were not comparable and if included would throw the comparison out of proportion. It was decided to let the testimony go in without embarrassing any of the Lincoln company officials by calling them to the stand in opposition to the rate application of the Bell.

Considerable time was also taken up by the state in presenting testimony given by W. H. Crumb, of Chicago, who has been specially engaged to assist in this hearing. His evidence was directed to the 4½ per cent gross revenue contract. The commission claims that the American Telephone & Telegraph Co. was sitting on both sides of the table when the contract was made, and they attack it as inequitable and as burdensome upon the ratepayers of Nebraska.

Mr. Crumb disputed the claims of the Bell that the general engineering staff is of invaluable aid in assisting subsidiary companies in solving their physical and practical problems.

As an illustration, he pointed out that the ingeniously-constructed truck that not only hauls poles but is of material use in setting them, which was claimed as one of the general staff inventions from which the Northwestern benefited, was available to everybody. He produced a circular from a private firm offering them for sale. To clinch his testimony, he directed the attention of the master to just outside the courtroom window where stood a truck of this kind owned and used by the Omaha Street Car Co.

Plant Put in During Wartime Permitted High Rates.

The experience of the Venango Telephone Co., one of the few companies organized in Nebraska during the wartime and which built its exchange and pole lines at a time when the peak prices were being charged for labor and material, is eloquent of what would have happened if reconstruction or new construction to large amounts had been forced upon existing companies instead of their being restrained from attending to the usual development work.

Venango was a new, live town and wanted service. Local men built the exchange, and when they got through they had an investment of over $200 a station. The business men and residents were perfectly willing to pay a good price for rentals, and the commission gave authority for a schedule that was nearly 50 per cent above those in vogue at like towns.

The company has just been given permission to continue these rates indefinitely, withheld before because of failure to keep accounts as directed by the commission. In the statements filed with the commission in connection with the application, the company set up that even at these unusual rates it is steadily running behind, not earning depreciation or dividends. It serves about 150 subscribers.

Increase Allowed in Local and Rural Rates.

The application of the McLeod County Telephone Co. for authority to increase local rates in Glencoe, Silver Lake, Lester Prairie, and Brownton, Minn., was allowed by the Minnesota Railroad & Warehouse Commission, July 24.

The McLeod County company has its principal place of business at Glencoe, and is engaged in the operation of local telephone exchanges at Glencoe, Silver Lake, Lester Prairie and Brownton. The company also operates a system of toll lines extending between and in the vicinity of the exchanges.

Hearings were held May 17 at Glencoe and Lester Prairie and no protests against the increased schedule were made. Jay Greaves, president, and T. C. Maconbrey, public accountant, represented the company.

Exhibits covering the operations of the company for the years 1919 to 1922, inclusive, were submitted, together with an exhibit showing the estimated return on the investment under proposed rates.

Upon review of all the facts in the case, the commission finds that the property has been, and is now being operated in an economical and efficient manner and that the present rates are inadequate to meet the requirements of the company.

The commission further finds that the rates petitioned for are fair and reasonable and will not yield more than sufficient revenue to provide for the necessary operating expense, depreciation and a fair return upon a fair value of the property.

It is therefore ordered that the McLeod County Telephone Co. be permitted to establish and place in effect, as of August 1, 1923, the following schedule of local and rural gross telephone rates at Glencoe, Silver Lake, Lester Prairie and Brownton:

Individual line, business (Glencoe)	$2.75
Individual line, business: (Silver Lake, Lester Prairie and Brownton)	2.50
Individual line residence (Glencoe)	1.75
Individual line, residence: (Silver Lake, Lester Prairie and Brownton)	1.50
Two-party line, residence (Glencoe)	1.50

Rural multi-party, metallic circuit, all exchanges 1.75
Rural multi-party, grounded circuit, all exchanges 1.50
Extension stations:
Business or residence, all exchanges, net ..... .50
Temporary disconnections one-half the regular rate for any class of service.

A discount of 25 cents per month is to be allowed on all local gross rates if paid on or before the 10th of the month in which the service is rendered.

Rural rates are payable quarterly in advance, with a discount of 75 cents if paid on or before the tenth of the first month of the quarter; 50 cents if paid on or before the tenth of the second month of the quarter, and 25 cents if paid on or before the tenth of the third month of the quarter, in which the service is rendered.

Telephone Service Refused Because of Power Line Liability.

Refusal of the Bluefield Telephone Co., Bluefield, W. Va., to install service in a $10,000 home built by J. E. Winfrey, a locomotive engineer of Mercer County, and which is separated from the telephone line between Bluefield and Princeton by the county road and the right of way of the Princeton Power Co., is the cause of complaint to the West Virginia Public Service Commission.

At a hearing held July 20 the telephone company claims that it would be violating ones of its rules by assuming liability that might result from crossing the power company's right of way with its wire. Winfrey is willing to pay the cost of installation but objects to any liability clause in the contract. He alleges that the telephone company has been giving service to individuals similarly situated.

Ordered to File Schedule Conforming to Commission's Views.

The Browning Telephone Co., Browning, Mo., has been ordered by the state public service commission to withdraw its schedule of rates canceling the schedule now in force, and to file its schedule in conformity to the views of the commission as expressed in a report.

The commission suspended the proposed schedule September 23, 1922, and further extended the effective date to July 28, 1923. On July 6 a public hearing was held in Browning and the commission's order was issued July 23, the new schedule to become effective September 1.

Rates Suspended Pending Hearing on Their Reasonableness.

The Missouri Public Service Commission on July 23 suspended operation of the proposed rates of the Winfield Telephone Co., Winfield, Mo., for 120 days or until November 19, 1923, unless otherwise ordered.

Complaint against the proposed rates was made by a number of subscribers, so the commission will hold a hearing as to the reasonableness of the proposed rates.

Oklahoma Commission Gives Approval for Rate Readjustment.

The Oklahoma Corporation Commission on July 26 approved an application submitted by the Savanna Telephone Co. for a readjustment of rates.

The company has been giving service on business telephones for $2 a month, residence telephones for $1.50 and rural multi-party home telephones for $1.25. The new rates are: $2.50 for business, $1.75 for residence and $1.50 for multi-party farmer line subscribers.

South Carolina Commission Would Examine Bell Books.

An appropriation of $1,000 has been set aside by the South Carolina Railroad Commission for an investigation of the books of the Southern Bell Telephone Company under provisions of a resolution unanimously agreed to by the commission on July 18. The investigation and expenditure are not to be made unless allowed by the courts.

The investigation is to be made, if allowed, for the purpose of securing evidence for the defense in the case of the telephone company against the state to prevent the going into effect of the state law

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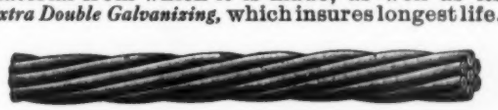

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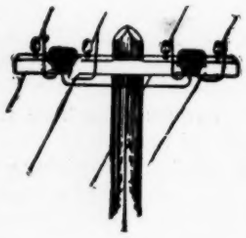

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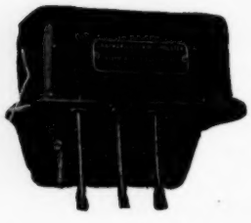

ordering the restoration of the rates in effect January 1, 1921.

This act, passed by the general assembly, if enforced, would have the effect of annulling the order of the railroad commission under which the new rate schedule was put into effect. Free intercity service, abolished by the order, would be restored and rates in some towns raised and in others lowered.

The state, Attorney General Samuel M. Wolfe announced recently, has been unable to make the investigation and was, therefore, faced with the possibility of being forced to send the case to its decision without offering any testimony in reply to the telephone company's showing.

Briefs Filed in Cumberland's Tennessee Rate Case.

On July 17 a brief containing the evidence and testimony offered in the case of the Cumberland Telephone & Telegraph Co., applying for an increase in rates, was filed with the Tennessee Railroad and Public Utilities Commission by attorneys for the company.

A brief prepared by attorneys representing patrons of the company was filed on July 18.

Advanced Rates Approved for Company at New Auburn, Wis.

An increased rate schedule and several new classifications were authorized for the New Auburn Telephone Co., of New Auburn, by the Wisconsin Railroad Commission's order of July 10. The old and new rates are:

	Old rates.	New rates.
Business:		
One-party	$1.50	$2.25
Two-party	....	1.80
Extension sets	....	.50
Desk sets	....	.25
Residence:		
One-party	1.00	1.35
Two-party	.75	1.13
Four-party	....	.90
Rural	1.50	....
Metallic	....	1.50
Grounded	....	1.35
Extension sets	....	.60

The company serves 274 subscribers of its own and furnishes switching service to 33 subscribers of the Dover Telephone Co.

All its lines, with the exception of one, are full metallic, and the book value of the plant and equipment is $15,894. The book value was accepted by the commission as a basis for depreciation and return, as it appeared to be very conservative. For this year, the commission estimated that $2,225 should be allowed for depreciation and return.

Operating revenues for 1922 amounted to $4,351, and expenses totaled $2,843, leaving $1,508 for depreciation and return—some $700 less than the commission's estimate.

Some increase in expense was anticipated for this year, due to an increase in the manager's salary. The company also expended $2,500 for a central office and home for the manager—an expenditure requiring an extra allowance for return and depreciation. These items, the commission estimated, would add $500 to the requirements for this year—making a total of $5,568.

It appearing that the proposed rates, together with miscellaneous revenue, would bring a revenue of $5,308—which was less than the commission's estimate of expenses—the schedule was approved.

The rates also carry with them free toll service to Bloomer, Chetek, Sand Creek, Dallas and Cameron.

To Issue Stock to Pay for Additional Property.

The Lewis Telephone Co., of Lewis, was authorized on July 18 by the Wisconsin Railroad Commission to issue of its capital stock in exchange for certain telephone property owned by private parties.

Summary of Commission Rulings and Schedule of Hearings.

ILLINOIS.

July 26: Illinois Bell Telephone Co. cited to show cause why rates in Chicago should not be reduced. The citation followed hearings on valuation which have been going on for months.

July 31: Hearing held in Chicago on the citation to the Illinois Bell Telephone to show cause why rates in Chicago should not be reduced.

MICHIGAN.

August 8: Hearing to be resumed on application of the Union Telephone Co., of Owasso, for increased rates in its various exchanges.

MINNESOTA.

July 24: Application of the McLeod County Telephone Co. for authority to increase local rates in Glencoe, Silver Lake, Lester Prairie and Brownton, granted. The new rates became effected August 1.

MISSOURI.

July 23: Proposed rate scheduled of Winfield Telephone Co., providing for increased rates at Winfield, suspended from becoming operative for 120 days from date.

July 23: An application of Browing Telephone Co. for increased rates in Browing, the company was ordered to withdraw its schedule and authority to file its schedule in conformity to the views of the commission expressed in its report. The new schedule becomes effective September 1.

NEBRASKA.

July 23: Application of the Buffalo County Telephone Co. of Pleasanton, for permission to increase rates, dismissed for want of prosecution.

July 23: In the matter of the complaint of Nordhus Bros. against the Northwestern Bell company, dismissed as satisfied. The Bell company had refused service to farm line subscribers, because a part of the men on the line had been delinquent in payment of tolls, and maintained its refusal in spite of the offer of complainant to keep money in bank in advance to meet toll bills.

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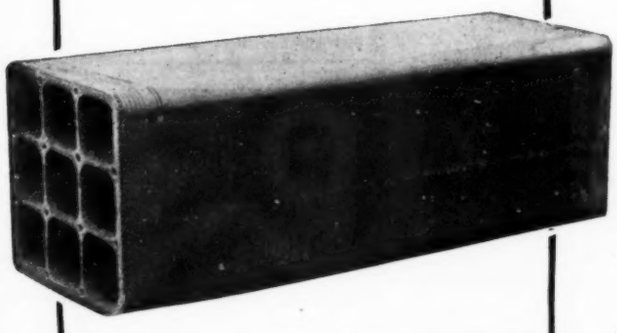

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July 24: In the matter of the application of the Craig Telephone Co. for permission to make a rate of 25 cents a month for extension bells, this being the standard rate, permission was granted.

July 24: Application of the Northwestern Bell Telephone Co. for permission to dispense with certain classes of service no longer called for on the Wayne exchange, granted.

July 24: Application of the Republican Valley Telephone Co., for permission to make a rate for magneto residence service, found reasonable and granted.

July 25: Application filed by the Farmers Telephone Co., of Newcastle, for permission to make certain changes in rates.

July 25: Complaint of Alex R. Wertz and others, of Star, against the Mineola and North Pole Telephone companies with respect to failure to furnish service, satisfied and dismissed.

NEW YORK.

July 31: Hearing held at Middletown before Commissioner Parsons in the case of Rosslyn M. Cox as mayor of Middletown vs. the Orange County Telephone Co. relative to rates for telephone service.

OHIO.

August 6: Hearing at Canton in the investigation, instituted upon the commission's owner initiative, of the city's telephone service to determine what steps shall be taken to improve it.

OKLAHOMA.

July 26: Approval given to application of Savanna Telephone Co. for readjustment of rates.

SOUTH CAROLINA.

July 18: Commission passed resolution appropriating $1,000 for investigation of books of Southern Bell Telephone & Telegraph Co. for purpose of securing evidence in the case of the company against the state to prevent the going into effect of the state law ordering restoration of the rates which were in effect January 1, 1921.

August 23: Hearing to be held with officers of the marine corps, Parris Island, and the Beaufort Telephone Co. with reference to charges for telephone connection to the marine corps barracks.

WEST VIRGINIA.

July 20: Hearing held on complaint of J. E. Winfrey against Bluefield Telephone Co. regarding refusal of the company to install telephone service in his new home.

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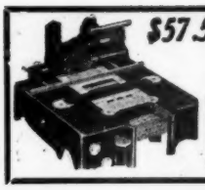
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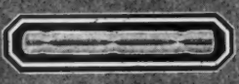
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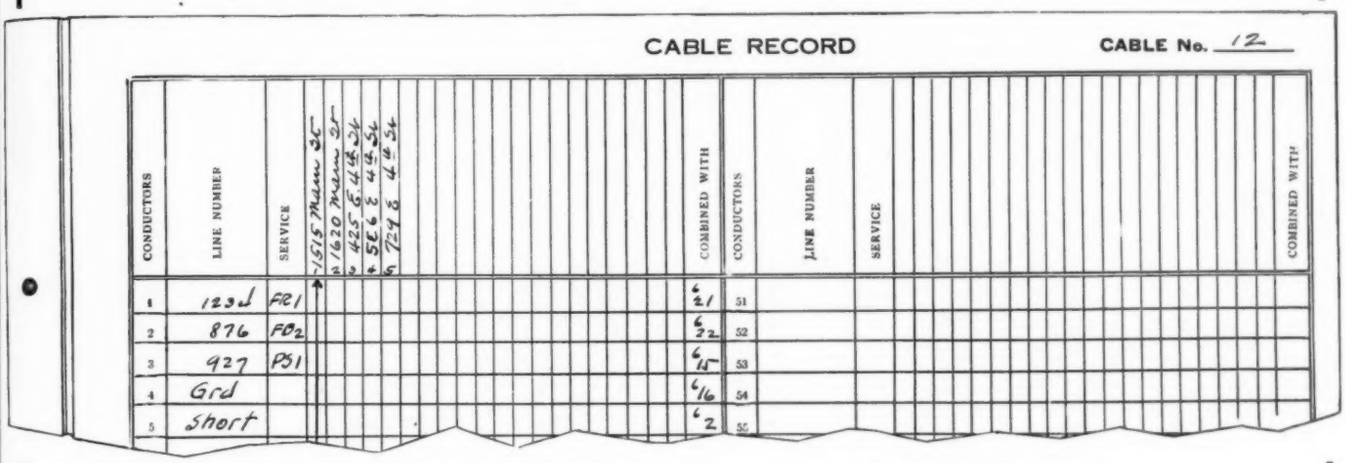

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Condensed Telephone News

Officers of Companies Are Urgently Requested to Forward to Us Promptly All Financial and Other Statements as Soon as Issued and Any Items Relating to Construction, Rebuilding, or Changes in Their Plants and Systems

New Telephone Companies and Incorporations.

ST. MARIES, IDAHO—The Heyburn Park Telephone Co. was recently organized with the following officers: G. H. Brown, president; J. A. Alvin, vice-president; Henry Rowinsky, secretary; Charles McGillivary, treasurer.

NEW PHILADELPHIA, IND.—The Blue Star Telephone Co. has been organized by T. L. Martin, P. C. Houston and M. M. Houston, with $10,000 capital.

MIDWAY, KY.—The Midway Telephone Co. has been incorporated with a capital of $6,000 by W. A. McKinney, F. M. McKinney and G. T. McKinney.

TEMPLE HILL, KY.—With $350 capital stock, G. H. Crabtree, B. L. Smith and H. D. Jones have organized the Peoples Telephone Co.

CLARINGTON, OHIO—The Citizens Telephone Co. has been organized by J. C. Dietrich, C. A. Smith, P. H. Montag, W. C. Case and B. E. Kelch with $10,000 capital.

Construction.

ST. MARIES, IDAHO—Work on a line from a ranch near Benewah Lake to connect with the line of the Interstate Utilities Co. at the west corporate limits of St. Maries, has been started by the Heyburn Park Telephone Co.

DECATUR, IND.—It has been announced that improvements to the Monroe street buildings of the Citizens Telephone Co., including the installation of a vapor heating plant, will be started within a very short time. In addition to the improvements to be made to the buildings, the company has purchased a common battery board, which will be installed and ready for use about January 1, 1924. The total improvements and betterments to be made in Decatur and at Berne will amount to $50,000.

INDIANAPOLIS, IND.—The Indiana Bell Telephone Co. recently began work on an addition to its central office plant in Irvington, a suburb of Indianapolis, to provide more space for housing equipment necessary for an extension of telephone service in the locality. The plant is a frame structure of the bungalow type. The addition is to be of brick construction, and will cost about $18,000.

The addition will provide enlarged restrooms for the operators, as well as additional indicator positions.

MACOMB, ILL.—The Macomb Telephone Co. has received authority from the Illinois Commerce Commission to construct and operate a toll line from Macomb to Adair, Table Grove, Vermont, Astoria and Ray.

BARNSDALL, OKLA.—The Bigheart Telephone Co. expects to begin the erection of a new building within a very short time. It will be an exchange and office building.

Miscellaneous.

DUNLAP, CALIF.—The Reedley Telephone Co. is planning to establish exchanges at Dunlap, Squaw Valley and Pinehurst.

LA PORTE CITY, IOWA.—The La Porte City Farmers Mutual Telephone Co. has purchased a two-story brick building, which was the home of the Farmers Savings Bank.

MORELAND, KANS.—R. A. Tobine has been authorized by the Kansas Public Utilities Commission to sell the Moreland Telephone Exchange to E. D. Corrick.

POTTER, KANS.—The Potter Telephone Co. has been sold to E. C. Yoakum, and he has started making improvements to the plant in order to better the service.

ALBANY, ORE.—The Pacific Telephone & Telegraph Co. has appropriated $20,000 for reconstruction work on the Albany exchange. Additional switchboard equipment will be installed and other improvements will be made. The Albany-Corvallis-Newport lead will be reconstructed at a cost of $97,000.

FLANDREAU, S. D.—W. Dailey, president; R. Johnson and G. A. Perley, secretary and manager, have filed application to continue the organization of the Rural Reciprocal Telephone Co. under the same name and with the same records. The capital named is $1,000.

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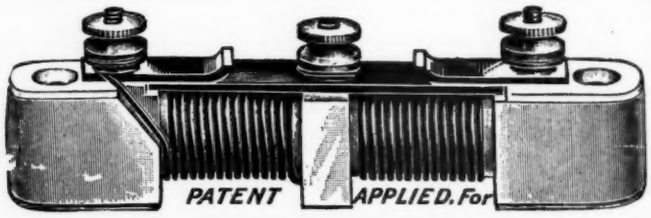

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